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Appendices.

A. Report of the Assistant Director and Chemist.

B. Report of the Entomologist.

C. Report of the Agricultural Officer, Mlanje Experimental Station.

D. Report of the Assistant Chemist.

E. Report of the Agricultural Officer, Ncheu.

F. Report of the Agricultural Officer, Blantyre.

G. Report of the Agricultural Officer, Nchena-Chena.

H. Zomba Experimental Station.

I. Lilongwe Experimental Station.

J. Zombwe Stock Farm, Experiment Plots.

K. Domira Bay Experimental Station. Progress Report for the Season 1937/38.

L. Agricultural Statistics.

M. Report of the Native Tobacco Board.

Report of the Director of Agriculture.

PART I.—Agriculture in Nyasaland.

Weather Conditions.

1. The weather was about normal during the first two months of the 1937/38 season. In the Lower Shire district general rains did not break until the fourth week of December, while in other districts generally, after local storms in November, good planting rains were experienced. North Nyasa was an exception, where the first rain of the season fell on December 9 and weather generally was dull and cloudy.

The weather during January had an adverse effect on crops, particularly the tobacco in the Southern Province. Excessive rains fell throughout the Southern Province the rainfall being the highest recorded for several years. In the Northern Province from Lilongwe northwards the incidence of rain decreased, till in the Mzimba district it was the lowest recorded of some years past.

February began with a general dry spell which was not broken until the fourth week.

March, April and May were more or less satisfactory generally. In the Lower Shire there was a drought lasting for seven weeks which finally broke on May 29. The dry spell however did not appear to affect the crops in that area to any severe extent.

In Karonga during April and May good rains fell, which during the latter month were higher than the previous years. These rains unfortunately were too late to repair the damage done by the earlier dry weather. After a fairly dry January in the tobacco areas of the Northern Province rainfall in March was slightly higher than usual, however all crops benefited generally.

During the remainder of the season weather conditions can be said to have been generally normal.

2. The totals for the six wet months and the six dry months for various localities are shown in the accompanying table.

Station	Zone	Total rainfall November 1, 1937, to April 30, 1938, Inches	Normal for six wet months Inches	Total rainfall May 1 to October 31, 1938, Inches	Normal for six dry months Inches
Port Herald ...	A	34.49	29.1	3.11	3.6
Port Herald Experimental Station ...	...	31.29	28.8	8.39	3.2
Chikwawa ...	...	24.32	29.7	2.00	2.3
Cholo ...	B	49.98	48.8	7.67	8.1
Makwasa ...	...	37.15	46.8	5.08	4.4
Lipumulo ...	...	43.21	—	9.22	—
Mikundi ...	...	46.51	—	8.47	—
Upper Mboma	...	48.07	—	.76	—
Masambanjati	...	50.71	—	10.94	—
Mlanje ...	C	58.37	66.6	9.91	14.5
Chitakali ...	...	67.89	65.5	15.88	12.1
Thornwood ...	...	49.52	67.8	10.35	11.6
Ruo ...	...	44.36	53.7	6.66	6.3
Glenorchy ...	...	46.61	56.2	9.75	10.1
Sayama ...	...	—	56.0	—	10.5
Lujeri ...	...	72.15	76.3	13.07	14.3
Chinsambo ...	...	70.34	—	14.66	—
Nalipiri ...	D	50.12	51.9	11.76	11.0
Blantyre ...	E	42.17	39.9	2.03	3.3
Limbe Catholic Mission ...	...	43.11	—	4.82	—
Chingaluwe ...	...	40.68	42.8	5.37	3.3
Nyambadwe ...	...	36.63	39.0	1.62	2.9
Chiradzulu Boma	...	37.38	40.0	2.66	2.5
Nyungwe ...	...	37.48	—	.95	—

Station	Zone	Total rainfall November 1, 1937, to April 30, 1938, Inches	Normal for six wet months Inches	Total rainfall May 1 to October 31, 1938, Inches	Normal for six dry Months Inches
Michiru	F	—	35.3	—	2.0
Namalanga	G	29.19	29.9	2.08	1.0
Nasonia		38.72	36.9	7.16	1.9
Zomba Experimental Station	H	63.47	46.8	2.35	4.6
Zomba Plateau		77.45	—	5.32	—
Likwenu		53.65	—	.31	—
Police Headquarters		61.65	41.9	2.29	1.8
Domasi		57.58	52.7	.56	—
Nankunda		66.78	—	3.00	—
Malosa		46.56	—	—	—
Mbidi	I	42.34	35.8	—	1.5
Makwapala Experimental Station		27.77	34.0	—	1.5
Mwanza	K	35.23	37.2	3.18	.6
Liwonde	L	38.81	31.7	.28	1.1
Bilila		—	28.0	—	.7
Mandimba	M	—	34.0	—	.3
Namwera		42.85	42.2	.73	.3
Chipunga		34.85	35.0	1.29	.8
Fort Johnston	N	30.97	29.4	1.39	1.2
Monkey Bay		30.68	29.2	—	.9
Malindi		31.89	—	3.45	—
Golomoti		—	29.5	—	.1
Ncheu	P	43.88	37.0	1.08	.9
Likuni	S	36.07	32.9	1.18	1.5
Chimvua		39.21	—	.70	—
Lilongwe		41.89	32.7	2.25	.8
Nathenje		37.88	—	.82	—
Mpali	T	33.60	—	.48	—
Dowa		34.97	33.1	.35	.7
Fort Manning		42.27	39.8	—	2.5
Domira Bay	U	29.36	31.0	—	.1
Dedza	V	39.88	39.7	1.10	2.2
Kasungu	X	23.88	29.1	—	.3
Mzimba		35.19	31.7	—	.2
Kota Kota	Y	35.68	48.2	.56	2.0
Chinteche	Z	43.95	62.9	8.05	5.1
Livingstonia		43.77	57.5	11.29	6.2
Karonga		40.10	52.3	1.32	2.8
Salima		28.02	—	.30	—
Glengary		52.63	—	2.90	—

Production and Export.

3. European production and acreage of the principal crops over the past years are given in the following table. Weights are given in long tons of 2240 lbs.

	1936		1937		1938	
	Acres	Yields	Acres	Yields	Acres	Yields
Tea	16,346	7,372,316 lb.	17,112	9,055,088 lb.	17,519	10,857,952 lb.
Coffee	336½	533¼ cwt.	566	510 cwt.	421	430 cwt.
Tobacco	7,349¼	2,663,360 lb.	6,862	2,714,208 lb.	8,151	2,918,720 lb.
Sisal	1,547	8,200 cwt.	3,952	6,160 cwt.	4,138	10,640 cwt.
Cotton (lint)	1,997	1,920¼ cwt.	949	1,006 cwt.	608	843 cwt.
Rubber	1,300	1,607 cwt.	1,300	1,685 cwt.	1,300	1,397 cwt.

4. Native production and numbers of growers of the two principal crops, *viz.* cotton and tobacco, are shown below.

	1936		1937		1938	
	No. of growers	Amount sold	No. of growers	Amount sold	No. of growers	Amount sold
Cotton (seed cotton)	66,159	6,381 tons	74,845	5,745 tons	47,058	5,584 tons
Tobacco	66,602	6,170 tons	86,053	6,582 tons	67,969	6,701 tons

5. The exported amounts and values of the various items of agricultural produce and of raw materials are given for the past three years in the table that follows.

	1936			1937			1938		
	Amount		Value £	Amount		Value £	Amount		Value £
Capsicums and chillies ...	12,129	lb.	151 ...	3,077	lb.	38 ...	9,091	lb.	114
Coffee	337	cwt.	628 ...	908	cwt.	2,051 ...	251	cwt.	587
Maize and maize flour ...	1,203,513	lb.	1,345 ...	1,171,005	lb.	1,307 ...	161,041	lb.	180
Potatoes	83,279	lb.	335 ...	39,588	lb.	159 ...	50,063	lb.	201
Rice	—		— ...	1,235	lb.	6 ...	115,801	lb.	517
Tobacco leaf dark-fired ...	7,702,031	lb.	224,642 ...	7,013,224	lb.	204,552 ...	6,130.359	lb.	178,802
leaf flue-cured ...	1,120,120	lb.	32.671 ...	1,230,824	lb.	35,899 ...	1,241,972	lb.	36,224
leaf air-cured ...	461,473	lb.	13,460 ...	746,274	lb.	21,766 ...	1,858,129	lb.	54,195
strips dark-fired ...	3,299,766	lb.	96,243 ...	4,384,886	lb.	127,893 ...	3,051,770	lb.	89,010
strips flue-cured ...	487,959	lb.	14,232 ...	646,081	lb.	18,844 ...	506,715	lb.	14,779
strips air-cured ...	320,192	lb.	9,339 ...	515,644	lb.	15,040 ...	674,518	lb.	19,673
Tea	7,706,088	lb.	256,870 ...	8,816,788	lb.	326,037 ...	10,218,821	lb.	448,477
Beeswax	232	cwt.	1,083 ...	320	cwt.	1,492 ...	14,625	lb.	609
Grapefruit	—		—	—		—	38,438	lb.	323
Cotton (seed)	1,679	tons	3,357 ...	895	tons	2,440 ...	675	tons	1,688
Cotton (lint)	2,375	tons	133,007 ...	2,066	tons	105,722 ...	3060	tons	99,953
Fibre (all kinds)	418	tons	3,346 ...	879	tons	12,900 ...	131	tons	1,575
Groundnuts	—		—	—		—	278	tons	1,724
Rubber	206,535	lb.	861 ...	203,175	lb.	3,449 ...	159,165	lb.	3,316
Soya beans	—		—	—		—	476,956	lb.	806
Strophanthus	16,191	lb.	1,619 ...	24,674	lb.	2,467 ...	20,825	lb.	2,082

The most notable increases during the year were in Tea, air cured Tobacco, Rice, Soya beans and Cotton. There were decreases in Coffee, dark fired Tobacco and fibres. The increase in exports of tea was due in part to weather conditions being suitable for the crop but in the main to increased acreages coming into bearing. The crop has now become the most valuable agricultural export of the Protectorate and is likely to maintain and improve that position. Increased quantities of rice were exported, although it is probable that production did not increase much, owing to the establishment of a rice mill at KotaKota and the organisation of sales. Soya beans appear among exports for the first time due to considerable plantings being undertaken by the British Central Africa Company and the increase in Cotton was due to exceptionally good climatic conditions in the Lower River area where the main production takes place. The figures of exports of Cotton are misleading in that large quantities of seed cotton were taken across the Shire and sold in Portuguese territory and it is estimated that at least 750 tons of lint was produced that does not appear in the export figures. The decreased export of coffee was due to continued falling off of production the causes of which have been referred to in previous reports. The falling off in dark fired tobacco was due to restriction of production in an endeavour to relate supply more closely to market demand. That of fibre relates mainly to sisal. The production in 1937 had been inflated owing to the reopening of estates and cutting of areas that had not been cut for some years previously. 1938 was in the nature of a return to normal cutting.

6. In spite of the considerably increased production of cotton the value of exports was below that of the previous year owing to the serious fall in prices. These showed on the whole a lower tendency which was particularly marked in the case of cotton. But for the new systems of marketing of Trust Land tobacco and cotton introduced during the year the prices realised by the native producer of both these crops would have been even lower. As it was considerable dissatisfaction was felt and the new systems of marketing were blamed for the unfortunate results.

TOBACCO.

7. The total figures for tobacco production for 1938 show a small increase in comparison with those for the previous year, the decrease in flue and fire cured types being more than offset by a considerable increase in the amounts of air cured.

The actual figures are given in the following table together with the 1937 figures.

Production

	1937 lb.	1937 lb.	1938 lb.	1938 lb.
EUROPEAN				
Flue-cured ...	2,292,752	2,714,208	2,369,584	2,918,720
Fire-cured ...	325,360		93,520	
Air-cured ...	96,096		455,616	
NATIVE				
Fire-cured ...		14,742,603	12,476,566	15,012,343
Air-cured ...			2,535,777	
		17,456,811		17,931,063

Exports

	1937 Amount lb.	1937 Value £	1939 Amount lb.	1939 Value £
Flue-cured ...	1,876,905 ...	54,743 ...	1,748,687 ...	51,003
Fire-cured ...	11,398,110 ...	332,445 ...	9,182,129 ...	267,812
Air-cured ...	1,261,918 ...	36,806 ...	2,532,647 ...	73,868
	14,536,933	423,994	13,463,463	392,683

Stocks of Nyasaland tobacco stood at 32,282,916 lb. on December, 31st. 1938, being $2\frac{7}{12}$ years supply on the usual basis. Consumption of Nyasa tobacco during 1938 amounted to 12,555,390 lb being an increase of 32,214 lb. on that of the previous year and representing 23.4 per cent of all Empire tobacco consumed. The latter figure compares with 24.0 per cent for 1937.

Exports of tobacco from Nyasaland in 1938, amounted to 9,230,640 lb. of leaf and 4,233,003 lb of strips, which are practically equal to the imports into the United Kingdom.

European :—European tobacco occupied 8,151 acres as compared with 6,862 acres in 1938, while production totalled 2,918,720 lb. as against 2,714,208 lb. in 1937. Acreages and yields are given by districts in Appendix L and the crop was disposed of as follows :—

	Flue-cured lb.	Fire-cured lb.	Air-cured lb.	Total lb.
Sold locally ...	2,335,872 ...	71,680 ...	358,736 ...	2,766,288
Exported direct ...	31,584 ...	21,168 ...	90,160 ...	142,912
Left on hand ...	2,128 ...	672 ...	6,720 ...	9,520

In comparison with 1937 the figures were as follows :—

	1937 lb.	1938 lb.
Sold locally ...	2,412,704 ...	2,766,288
Exported direct ...	143,472 ...	142,912
Left on hand ...	158,032 ...	9,520

The state of the industry was somewhat more satisfactory than in the previous season. Prices offered on the Auction floors for flue cured tobacco were higher than had been paid in the years immediately previous. It is however by no means certain that the improved prices were due to the system of selling by auction introduced during the year, though this system was doubtless a contributory cause.

Native :—The number of registered Native Trust Land growers was as follows :—

Northern Province	40,453
Southern Province	11,862

The figures represent decreases of 31.29 and of 4.83 per cent respectively when compared with the registrations of the 1936/37 season. The figures for 1936/37 were 58,878 and 12,465.

The total amount of Native Trust Land tobacco produced in the two provinces was as follows. The figures for the 1937 crop are quoted for comparison.

Southern Province.

	1936/37 lb.	1937/38 lb.
Mlanje	1,368,423	809,645
Cholo	30,408	34,862
Blantyre	367,892	72,022
Chiradzulu	861,036	670,006
Zomba	216,212	169,277
Upper Shire	27,645	136,379
South Nyasa	—	1,051
Total	2,871,616	1,892,242

Northern Province.

Ncheu	219,551	378,306
Fort Manning	208,020	163,189
Dedza	549,104	241,534
Dowa	1,777,377	1,979,175
Kasungu	35,259	24,593
Kota Kota	554,230	455,314
Lilongwe	4,641,486	3,926,028
Total	7,985,027	7,168,139

In 1938 the amounts purchased by the Board at their receiving stations were :—

	lb.
Palombe	765,877
Namalanga	578,901
Limbe	240,757
Zomba	169,277
Mlomba	34,925
Mbemvu	154,322
Sharpe Vale	207,816
Balaka	118,673
Nsaru	2,063,497
Lombadzi	1,256,580
Nathenje	1,507,861
Mponela	1,912,813
Tembwe	49,082
Total	9,060,381

The average amounts produced per grower on Native Trust Lands were :—

	lb.
Southern Province	159
Northern Province	177

Purchases from tenants on private estates were as follows, 1936/37 figures are given for comparison :—

	1936/37 lb.	1937/38 lb.	Increases lb.
Southern Province	1,230,985	1,293,881	62,896
Northern Province	2,654,975	4,658,081	2,003,106
Total	3,885,960	5,951,962	2,066,002

The total figures of the dark-fired crop were 12,476,566 lb. Of sun and air cured 2,535,777 lb.

10. Weather during the dry period during which young plants were being raised for transplanting was conducive to good growth and little disease was seen. A few plantings were made in some southern areas in November but most southern areas were planted up in December and the bulk of the northern plantings took place in early January.

Generally, rainfall was on the high side during December and January and, unfortunately throughout the Southern Province, was excessive during the remainder of the season. In the Northern Province, however, good growing conditions prevailed during February and March.

Unfavourable conditions in the Southern Province led to a crop of low yield and poor quality but the good conditions during the critical mid-growing period of the northern dark-fired tobacco areas led to a very good crop.

Similary the tobacco crop of Ncheu which was air and sun cured benefited by good weather conditions and a good crop was obtained.

The Board in 1938 purchased all leaf tobacco from growers on Native Trust Lands and placed such tobacco on warehouse floors at Limbe and Lilongwe for sale by auction.

COTTON.

11. *Native.* The native cotton crop was the second largest ever produced in the Protectorate and if allowance is made for the quantity that was sold outside the country, fell not far short of the record crop of 1935. The causes of this satisfactory result were the favourable weather conditions during the growing season. The incidence of bollworm attack remained fairly high in spite of an improvement in the clean up of old plants at the end of the previous season.

The Lower River crop amounted to 3,260 tons of seed cotton as against 3,001 tons in the previous year and it is confidently estimated that a further 2,000 to 2,500 tons was sold outside the Protectorate. This was due in part to (1) higher prices that were offered in Portuguese Territory across the river (2) to lack of understanding of the new marketing system (3) the fact that tax is collected at the cotton markets.

In the central part of the Southern Province there was a further fall in production from 860 tons in the previous year to 666 tons and in the southern part of the Northern Province, a reduction from 1,657 to 1,345 tons. Production in North Nyasa continued to expand and 313 tons were sold compared with 227 tons in 1937.

Private estates produced 1,591 tons and the total sold in the country was therefore 7,175 The figure for 1937 was 6,591 tons.

Exports amounted to 17,136 bales against 11,572 in 1937. Prices were considerably lower averaging .827 pence per lb. for No. 1, .585 pence for No. 2 and .201 pence for No. 3. Comparable figures in 1937 were 1.039d. .284d. and .225d. The total sum paid out to Trust Land Cotton growers was £39,687 together with possibly £20,000 for sales outside the Protectorate.

The production factor per lb. of seed issued was 2.66 in the Lower River areas, 4.69 in the remainder of the Southern Province and 6.59 in the area of the northern extension of the railway. The percentage of No. 1 grade in the Trust Land crop was 87.5 per cent. as against 83.91 per cent.

Details of Trust Land and Private Estate Seed Cotton production by districts were as follows:—

Southern Province	tons	Northern Province	tons
Lower Shire	1,472	Ncheu	315
Chikwawa	2,345	Dedza	361
Cholo	424	Dowa	981
Mlanje	38	Kota Kota ...	298
Central Shire	253	North Nyasa ...	313
Blantyre	73		2,268
Chiradzulu	—		
Zomba	—		
Upper Shire	263		
South Nyasa	39		
	4,907		

A new system of cotton marketing was introduced for the 1938 crop. This consisted of selling by auction the right and obligation to purchase all seed cotton brought to each particular market at the price bid per lb. for the cotton that would come to that market. The selling price was based on 3 months futures of American Middling at the time of auction and automatically increased or decreased for each rise or fall of 12 points in 3 months futures by $\frac{1}{32}$d.

The system worked on the whole well, though it was found to be susceptible of improvement in details. Marketing was simplified, the quantity of lint exported improved, buying costs were lower and the seller received a better price in comparison with the market value of the cotton than in previous years

The incidence of red bollworm attack remained high and it is evident that much work on this pest remains to be done.

During the year the Empire Cotton Growing Corporation posted an entomologist to the country to carry out work on the life history of this pest with a view to the improvement of control measures.

12. *European*:—European production of seed cotton amounted to 126 tons against 151 tons in 1937.

Tea.

13. Owing to the International Tea restriction scheme and the fact that most of the Protectorate's quota was already planted, 397 acres only were planted during the year, 181 acres only of the 17,700 allocated remained unplanted at the end of the year. The first period of restriction came to an end at 31st March and the second 5 year period then began. In December a further 2,500 acres were offered to Nyasaland subject to certain conditions. These were accepted. The most important conditions attached were that the maximum of the cess on tea exported was to be raised from 1/- per 100 lb. to 2/-, and that a quota for export during the restriction period was set. The proceeds of the cess are devoted to propaganda to increase consumption both in and outside the Protectorate.

Production rose from 9,055,088 lb.† in 1937 to 10,857,952 lb. in the year under review while exports rose 15.9% to 10,218,821 lb. valued at £448,477.

The Agricultural Department's tea experimental station at Mlanje continued its investigations of problems affecting tea production both on the station itself and and on tea estates in Mlanje and Cholo. The main lines of work were on pruning methods, fertilisers, methods of preventing erosion, the effects of various intensities of plucking on production and on *Armillaria* root disease.

Coffee.

14. The European acreage under coffee continued to shrink from 566 acres in 1937 to 421 acres at the end of 1938. Acreage, production and exports of coffee were as follows during the past 4 years.

	Total acreage	Production cwt.	Amount exported cwt.
1935	995	1,605	603
1936	837	553	168
1937	566	510	173
1938	421	430	251

Coffee is not a crop suited to the areas in which it has mainly been grown and has already ceased to be of importance. Small amounts of coffee are now being grown by natives at Masambanjati in the Cholo district and near Nchena-chena in the Mzimba district in which area conditions are more suitable. The native area at Masambanjati suffered from a severe attack of Cameron Bug, *Antestia*, and yields were seriously reduced.

Tung Oil.

15. Further plantings during 1938 brought the acreage of tung oil up from 1,171* in the previous year to 2,068 acres. Of these the bulk were *Aleurites montana*, though some *Fordii* is still being planted. In most areas it is clear that *A. montana* is likely to be considerably the more productive of the two, and *Fordii* is unlikely to prove an economic crop. No crushing has as yet taken place, most of the nuts produced having been used for seed. Exports will however commence shortly. A Tung Growers Association was formed during the course of the year.

NOTES: †Owing to an error in returns made in 1937 this figure was given in the 1937 report as 14,466,592 lb.
*See appendix L.

Sisal

16. The improved production of 1937 due to the re-opening of estates owing to improved prices was not maintained and exports fell from 1,968,345 lb. valued at £12,900 to 293,953 lb. valued at £1,575.

Rubber.

17. Production of rubber fell from 188,720 lb. in 1937 to 156,464 lb. in 1938 but the value of exports remained approximately the same.

Strophanthus.

18. There was a small reduction in the export of this crop compared with the previous year.

Native Food Crops.

19. The main native food crop, maize, yielded on the whole a poor crop in the Southern Province. After promising extremely well in January growth and productivity were checked by the continuous and excessive rain. In the Northern Province conditions were more satisfactory generally and a fair crop was secured. In the Lower River area production was further reduced owing to the flooding of the river which destroyed a good deal of a promising crop, and reduced the areas available for planting.

Sorghums and millets fortunately produced yields over the average in most areas where they are grown.

Root crops, cassava and and sweet potatoes yielded well up to the average and increased plantings of the latter in the Lower River area did much to relieve a food position that would otherwise have been critical.

Groundnuts were planted to a larger extent throughout all areas except the north and gave satisfactory yields. In Ncheu and Dedza districts particularly, production was largely increased. Considerable sales were expected from this area but dissatisfaction with the price offered caused producers to retain and consume the bulk of the crop. Little rosette disease appeared.

Pulse crops were satisfactory in nearly all areas.

Rice was planted over slightly wider areas both in the Kota Kota district and the Lower River area and yields were satisfactory.

Pests and Diseases.

20. *Locusts.*—Only the red-winged locust, *Nomadacris septemfasciata*, Serv., was present in the Protectorate during the year, and for the third year in succession its distribution was confined to that part of the territory south of the 14th Parallel.

So little breeding occurred during the season 1937-38 that very few adult swarms of the 12th generation were present in the country during the March-July period. Towards the end of, and after, this latter month flying swarms from the south and south-west re-invaded the Protectorate and by the end of the year much the same area of country, as previously, as far north as the Dedza district Lake littoral had been covered by egg-laying swarms. Egg-laying was most concentrated in the Shire and Bwanje river valleys, that in the Highlands being, for the most part, dispersed and scattered. Hoppers of the 13th generation did not begin to hatch until the very end of December, the first hatchings taking place in the Lower Shire district.

As a consequence of this unexpected, and inexplicable, absence of locusts for the major part of the year very little damage by them to any crops was experienced. More detailed information is given in the Report of the Entomologist.

21. *Crop Pests.*—It is interesting to record that the cotton crop from the Lower River districts showed a considerable increase, in spite of a decrease in the acreage planted, over the past two years. It would be difficult to prove, however, what influence the rigorous "dead season" of these two years may have had on the incidence of bollworm and stainers, but the fact cannot be ignored.

The most important development during the year was the appearance in May of gelatine grub, the larvae of the *Limacodid* moth *Niphadolepis alianta*, Karsch in enormous numbers on two tea estates in the Cholo district. The pest is referred to in more detail in the Reports of the Entomologist and of the Agricultural Officer, Mlanje. Being an entirely new and unexpected development, without any strictly comparable occurrence in other tea-growing countries, some little time will be required before the situation can be properly understood and methods for dealing with it devised.

It is desirable to make clear, however, that this outbreak of gelatine grub is not really the sudden appearance in vast numbers of a new insect feeding on the tea crop, in one season. The insect is indigenous to East and Central Africa, was recorded, as isolated individuals, from tea in the Mlanje district as long ago as 1926, and there is no doubt that the present situation is the result of development over a period of time of a particular insect that has always been present, accelerated perhaps by some unknown break down in natural control, and certainly aided by the vast extension in recent years of a suitable food-supply, tea, in the area concerned. This being so its suppression must be expected to require a certain amount of time and concentrated effort. It may die out suddenly but there is no particular reason, as yet, for supposing that this will happen. In any case the pest cannot be eliminated from the tea areas and all measures for its control must be aimed at reducing it to a reasonable level and keeping it there. The employment on all tea estates of a permanent "insect gang," of a sufficient size to cover thoroughly the estate, *at least twice a year*, searching for and collecting caterpillars and other insects would be well justified in expense, in view of the tremendous increase in acreage of this one crop in the past few years in somewhat concentrated areas. The freedom of the Nyasaland tea crop from major insect pests, so often commented upon in the past, cannot be expected to remain a permanent feature of the expanding industry.

22. *Crop diseases.*—No serious outbreak of crop disease was reported in 1938, nor was the incidence of the diseases normally present high.

Advisory Bodies and Policy.

23. The Native Welfare Committee continued to deal with matters affecting the native population.

The Agronomic Sub-Committee of this Committee held a number of meetings on the subject of soil erosion control measures and reviewed the surveys made by the Soil Erosion Officer. This work is fully reported on elsewhere* and will not be repeated here. Satisfactory arrangements were, however, come to during the year for co-operation between all departments concerned to bring into effect measures to combat erosion.

24. The policy of the Department was specifically set out during the year for the purpose of a general statement of policy prepared for the Native Welfare Committee. The following is an extract from this statement.

"1. The policy of the Department is based on the following aims :—

(*a*) The preservation and improvement of the land which is the natives' chief material asset.

(*b*) Enabling the native to secure the maximum crops consistent with (*a*) above which will provide an adequate and balanced food supply and where possible cash or economic crops for sale.

(*c*) Ensuring that he shall receive the best price for his cash crops consistent with local and world market prices, transport costs etc.

2. To carry out this policy to the best effect the Department's functions fall under three main heads (*a*) Investigation, (*b*) Demonstration and Propaganda (*c*) Legislation.

Investigation includes experimental work on :—

(*a*) methods of cultivation, prevention of land deterioration by erosion and other means, composting, manuring etc.

(*b*) Crops, yields and suitability of different varieties, conditions under which they may best be produced etc., prevention of pests and diseases.

The above are carried out at various Experimental Stations of the Department throughout the country and at Experimental Stations of the Native Tobacco Board and of the Empire Cotton Growing Corporation.

(*c*) Investigations of native habits, customs and lines of thought in connection with securing that the recommendations of the Department are carried out.

Demonstration includes :—

(*a*) The actual demonstration of improved crops, improved methods of growing them, improved means of maintaining and increasing soil fertility on plots maintained for the purpose, improved preparation for market.

(*b*) Direct propaganda and instruction to individuals and groups by the agricultural staff, with local demonstration in the natives' own gardens.

(*c*) Similar measures carried out by, or through, other officers of Government.

(*d*) Indirect demonstration and propaganda, *e.g.* through agricultural shows.

*Vide reports of Native Welfare Committee and Conservator of Forests.

Legislation: is maintained at a minimum and is devised mainly towards (*a*) preventing the individual from harming his neighbour, *e.g.* legislation for the control of pests, and diseases and (*b*) ensuring fair dealing in marketing.

3. Departmental policy may be illustrated by the following extracts from a circular of standing instructions to Departmental Staff.

"3. Functions of Departmental Officers. An Agricultural Officer is posted to a district or area to act in an advisory capacity to the Administrative Officer in matters relating to agriculture and to further the progress of agriculture in his area. He may have Supervisors to assist him. In order to further the progress of agriculture effectively an officer must first understand the problems with which the native is faced and his point of view. This in turn demands an intimate knowledge of his conditions of life. The problem necessarily varies from district to district and even within much smaller areas and it is not therfore possible to give general instructions. The following are however the main heads under which agricultural work falls and to which attention should be given:—

(*a*) *Maintenance and Improvement of Fertility.* This is of primary importance. It involves prevention of erosion and wash. General improvement in the standard of cultivation. Rotations adopted to local conditions, use, methods of making and storage of farmyard manure and compost.

Improved implements and how to use them.

(*b*) *Seed.* Value of the use of improved seed, seed selection, maintenance of purity, seed issues.

(*c*) *Disposal of crops.* Seed and food storage. Weevils, rats, harvesting with a view to improvement of quality of produce, markets and marketing. Sales by weight, supervision of prices.

(*d*) *New and Improved Crops.* Generally a crop new to a district should not be given to the native cultivator until it has been proved that it will succeed under local conditions. Subject to this proviso there is much scope to increase diversification of cropping particularly towards improvement of nutrition. Particular attention should be paid to vegetables and fruit and to crops that will raise the protein balance of the normal rations.

(*e*) *Maintenance of a proper balance of cropping.* The first consideration in connection with native agriculture is the provision of adequate food supplies for the population of the area and in certain cases for local sale. The production of "economic" crops is to be encouraged but must be fitted in to the general agriculture of the district both from the point of view of maintenance of fertility and food supplies.

(*f*) *Legislation.* While it is undesirable to introduce legislation if it can be avoided, nevertheless legislation directed to improve the quality of produce, to prevent the spread of pests and diseases and for similar purposes may be found necessary.

(*g*) *Native Authorities.* Every assistance and encouragement should be given to native authorities in any efforts they may make for the improvement of agriculture. A small effort by a native authority is likely to have more effect in the district than a much larger effort by Government.

(*h*) *Seed bulking.* In view of the high cost of transporting seed and the need for improvement in the general level of seed supplies, it may often be desirable to establish seed bulking plots in a district. It will often be found that acclimatised seed is preferable to imported seed.

(*i*) *Agricultural capitaos.* Until trained agricultural instructors become available great care and attention should be given to the supervision and instruction of the existing capitaos. Their value depends almost entirely on the supervision and instruction given them.

(*j*) *Agricultural shows.* The organisation of small local native agricultural shows by administrative officers may be of value in promoting agriculture. Every possible assistance should be given.

(*k*) *Co-operation with other Departments.* Officers should co-operate closely with officers of other departments in their areas to their mutual assistance. This is particularly desirable in the case of officers of the Forestry and Veterinary Departments in anti-erosion measures.

(*l*) *Livestock.* While this Department is not charged with responsibility for animal husbandry services agriculture is incomplete where the proper uses of stock does not come into the picture. To take its proper place in the economy of the country live-stock must be considered from its economic aspect and particularly in regard to its functions in supplying milk and other animal products and manure. Without in any way infringing on the province of the Veterinary

Department much valuable work may be done in educating the stock-owning population to a better appreciation of the possibilities of their stock from these points of view and following on this an appreciation of the possibilities of providing food for this production from cultivated land.

4. *Demonstrations and Propaganda.*

(*a*) A great difficulty facing an officer in native agriculture is to persuade the people of the correctness of the methods it is desired to encourage and that they will pay them. Ocular demonstration is of far greater value than verbal persuasion. Demonstration plots are of great value in this respect provided that they are carefully and efficiently managed and provide a demonstration that will strike the eye.

Of even greater value than a demonstration plot run by the Department is a holding worked by a native himself on better lines. Endeavours should be made to find individuals who are willing to adopt better methods. Having found such people they should be given all possible assistance with advice, encouragement and the assistance of a capitao to improve their holdings. Such people become most valuable propagandists for general improvement. Others are much more ready to attempt what one of their own kind has done than anything which is financed by Government and which they often regard as beyond their powers and means.

Every effort must be made to gain the confidence of the people. It is only by securing their confidence that progress will be achieved and nothing should be recommended that is not definitely known to be beneficial and within the powers of the people to whom it is recommended.

Contact should be made with any Jeanes teachers in the district and use should so far as possible be made of their services to further these aims.

The better an officer gets to know his district and the people in it the easier his work becomes and the more good he can do.

Officers should bear in mind that certain native agricultural practices and systems which have been evolved by experience have merits under local conditions which are absent from more orthodox systems of agriculture. It should be the aim to adopt and to build up a better agriculture and fit together the best of both systems based on the existing system rather than to endeavour to secure radical changes."

25 There has been some advance in native agriculture generally during the year under review but improvement is very slow. It is evident that concentrated work is effective but except in certain specialised areas this concentrated work cannot be carried out by existing staff. The need for trained African personnel to maintain contact with and to instruct and encourage the native cultivator is severely felt, and until such staff exists in adequate numbers progress cannot be rapid. Of the existing native staff few have had any agricultural training, the staff is efficient within its limitations but is not competent to influence and instruct or to realise to what failures are due.

26. A marketing of Native Produce Ordinance was passed during the year but has not yet been put into effect. In spite of the comparative lack of effect of efforts to market certain native produce on the lines that this Ordinance will encourage there is little doubt that a satisfactory marketing organisation, particularly for lower priced crops, will prove here as elsewhere one of the most potent aids to agricultural progress. Unless the producer can be assured of the best price that the market and handling costs will allow it is not to be expected that he will readily produce for sale.

27. There exist minor sources of income for the native which might well be developed. The production of fruit, vegetables and eggs near towns is inadequate to meet the need and could be increased considerably. In stations close to the Lake it is often impossible to secure fish.

28. Due to an increasing number of men going abroad to work certain agricultural operations which are normally considered to be men's work are now being carried out by women and the need to reach the women with propaganda and instruction is becoming more pressing. It is not an easy matter to gain their confidence but it is becoming more and more necessary to direct attention to them in agricultural work and persistent efforts to secure their confidence are needed.

The effects of the absence of large numbers of the most useful of the population is tending to slow down agricultural progress and even leading to retrogression. If the movement continues to increase there is undoubtedly danger of serious food shortages in the event of a generally unfavourable season.

Part II. Work of the Department of Agriculture.

29. As explained in the previous report agricultural work in the Protectorate falls under the control of three organisations, viz :— The Department of Agriculture, the Native Tobacco Board and the Empire Cotton Growing Corporation. Reports on the work of the latter bodies are published as appendices to this report, and only the work of the Department of Agriculture will be mentioned here. Close touch is maintained between them and their functions are necessarily intermingled.

Organisation.—Three agricultural officers only functioned throughout the season on native agriculture.

Agricultural Officer, Blantyre was in charge of Lower Shire, Chikwawa, Blantyre, Central Shire and part of Cholo districts, with Supervisors at Chikwawa, Chiromo and Blantyre. Agricultural Officer, Ncheu was in charge of Ncheu, South Nyasa, Dedza, Dowa, Kota Kota, and part of Upper Shire districts with Supervisors at Fort Johnston, Salima, Ncheu, Dedza and Kota-Kota.

Agricultural Officer, Nchena-chena was in charge of North Nyasa, part of Mzimba and Chinteche districts with a Supervisor in North Nyasa.

Other areas were in charge of Native Tobacco Board Supervisors or were without agricultural staff.

EXPERIMENTAL STATIONS.

Agricultural Department Stations

30. *Port Herald*, vide Appendix F. Owing to shortage of staff it was not possible to carry out any experimental work during the year, and thirty acres of the Mphala station were allowed to revert to bush, the remaining twenty acres growing food crops. The Dimba station was flooded early in January and remained under water until May, but small late crops of maize, beans and sweet potatoes were obtained.

31. *Makwapala*, vide Appendix H. This station was supervised by the Officer-in-charge of Zomba Experimental Station as a sub-station of the latter. Apart from seed production, work was mainly directed to restoring fertility to the worked out and eroded soil. There are indications that this can readily be done by methods which can easily be carried out by native cultivation and a number of experimental plots to test such methods were laid down.

32. *Masambanjati Coffee Station*, vide Appendix F. The native coffee gardens supervised from this station have not given good results this year. Owing to a severe late infestation with Cameron bug (*Antestia variegata*, Thumb.), and the attacks of various fungi on the injured berries, the yields obtained were extremely poor. Apart from this the bushes show general signs of unthriftiness and it seems probable that the soil is deficient in some essential element. Investigations to determine the nature of this deficiency have been commenced. At the station experimental work on coffee continued and further plots have been put down to compare Agiobada and single-stem pruning. On the observation plots of tung oil trees, which are now four years old *A. montana* has made good growth and most of the trees bore a fair crop, but *A. Fordii* has made poor progress and gave very little fruit.

33. *North Nyasa*, vide Appendix G. No experimental work was attempted during the year but demonstrational work was carried on as usual. Seed of selected groundnut and maize varieties was multiplied for distribution and a small holding of 10 acres was started which is to be farmed on a suitable rotation, fertility being maintained with pigeon pea and compost.

34. *Mlanje Experimental Station*, vide Appendix C, is almost entirely concerned with investigations on tea. Experiments on manuring, pruning, intensity of plucking etc. were carried out at the station and also on plots on various estates. A collection of cassava varieties from all over Nyasaland and from Amani was established at the station during the year with a view to selecting promising varieties which are resistant to mosaic disease.

Native Tobacco Board Stations.

35. *Zomba*, vide Appendix H. This station is financed partly by the Native Tobacco Board and partly from Government funds. Apart from specialised work on tobacco, investigations are mainly directed towards soil conservation by ridge terraces, composting and green manuring, and the trial and multiplication of food crops calculated to improve native diet. The modified Nichol's system of ridge terracing proved entirely satisfactory under very heavy rainfall early in the year. Pigeon pea and sunn hemp have been shown to be outstandingly valuable crops for soil improvement, the latter having several subsidiary uses to recommend it to the native, *e.g.* the stems can

be used for the underthatch of houses and in shading tobacco seed beds and useful string and rope can be easily prepared from the fibre. Over 400 tons of compost were made and it is interesting to note that native cultivators were ready to purchase it, there being a fair demand for small quantities. With a view to the improvement of native diet a wide range of food crops was grown and seed supplies of selected varieties, especially soya bean, are being bulked up in readiness for distribution.

Tung oil trees continued to grow satisfactorily and yields were again appreciably increased over the previous year. A considerable amount of *A. montana* seed was sold to European planters but there was little demand for *A. Fordii.* Preliminary trials with various methods of budding were commenced.

36. *Lilongwe*, vide Appendix I. The station at Likuni and a sub-station at Chimvua are financed by the Native Tobacco Board, but experiments are not confined to tobacco alone. Investigations are proceeding on the manuring of tobacco, maintenance of fertility by rotational green manuring and compost, and the trial of soya bean and cotton varieties. At each station a small holding is run and a demonstration.

Empire Cotton Growing Corporation Station, vide Appendix K.

37. Experimental work during the year comprised variety trials, and cultivation and spacing experiments. Intensive investigations on red bollworm (*Diparopsis castanea*) were commenced by the newly-appointed entomologist.

District Work.

38. The scope of this work and the part played by the staff of the Agricultural Department and Native Tobacco Board in carrying it out has been indicated in the Annual Report for 1937 (page 14). Progress during the year under review may be summarised under the following headings:—

(1) *Demonstration Plots.* An increasing number of plots have been established in the districts with the object of giving the native a practical demonstration of improved methods of farming involving continuous cultivation and maintenance of fertility by green manuring and compost, the prevention of erosion, and more efficient cultivation of growing crops. The main plots in charge of the Agricultural Department are listed below, but in addition to these the Native Tobacco Board Supervisors have established a number throughout the tobacco growing areas.

North Nyasa: Kasisi, Hara, Nkamanga, Hewe, Nisiku Hills.
South Nyasa: N.A. Jalasi, N.A. Mponda, N.A. Makanjila.
Upper Shire: N.A. Kalembo.
Ncheu: Sharpe Vale.
Dedza: N.A. Kaphuka, N.A. Kachindamoto.
Dowa: N.A. Karonga (Salima), Dowa Boma.
Kota Kota: N.A. Mwadzama, N.A. Kasakula.
Lower River: Tengani, Muona, Mafumbe, Nkadana.
Blantyre: Kapeni, Kuntaja.

These plots are normally each in charge of a capitao with a certain amount of paid labour to assist him and are farmed on simple, usually 2-course, rotations. The methods employed are such that a native can readily emulate them himself, all work is done with native tools, and buildings are simply constructed of materials which he can readily obtain from the bush. Seed selection is practised and the majority of plots are equipped with efficient grain stores. Where possible attempts are being made to encourage animal husbandry in connection with these plots, but the introduction of the plough is scrupulously avoided. Capitaos encourage natives in the district to visit the plot periodically and explain the work in progress. Interest in these demonstrations appears to be slowly increasing and in some places a few natives are trying out the methods shown on their own farms.

(2) *Soil Conservation.* Efforts to get native cultivators to adopt measures for minimising soil wash have continued and steady progress has been made in the amount of land put under ridge cultivation instead of *matutu*, and in ridge terracing. During the year 150 acres in the Chikwawa foothills were fully protected, and it is estimated that contour bunding has covered 355 acres in the Nchisi escarpment area of Kota Kota, 210 acres in the central hill region of Ncheu district and 3,340 acres in Lilongwe district. Natives have been encouraged to plant bananas, plantains, mangoes, sugar cane, cashew nuts and other soil-retaining crops along stream banks, and a fair amount of land has been planted with the first two crops.

(3) *Food Supplies.* Propaganda and work in several districts has been directed towards ensuring an adequate food supply and in improving the native diet. Where the main staple crop is seen to be poor natives have been encouraged to safeguard themselves by planting alternative crops, e.g. sweet potatoes and cassava when the maize crop is failing. In the Makanjila distressed area of South Nyasa an agricultural supervisor has concentrated on improving the food position by such measures as extension of garden acreages, preliminary cultivation and more efficient cultivation of the growing crop, provision of suitable grain stores, and seed distribution. In order to try and effect some improvement in native diet, fruit trees have been planted in many of the demonstration plots and in some villages and well settlements. Attempts have also been made to encourage the growing of foodstuffs of high protein content such as groundnuts and soya beans.

(4) *Water Supplies.* Eighteen well sites were completed in South Nyasa district and fifty more selected in that area and in Dedza, Dowa, and Kota Kota. Demonstration plots have been opened near some of the well settlements and attempts made to encourage agricultural development along the right lines. In this respect particular efforts have been made to influence the natives of the Bwanje Valley area by a demonstration plot at Sharpe Vale, which forms part of a rural development scheme.

Entomology and Plant Pathology.

39. These matters have been referred to earlier in this report and particulars are given in Appendices B and C.

Botanic Gardens and Plant Introduction Station.

40. This station, consisting of 55 acres, has continued to prove its value for the establishment of permanent crops. A large planting of *Oxytenanther abyssinica* has been established and will, in time, supply the needs of the Zomba Experimental Station. Various varieties of sugar cane were produced and issued to native growers in the Zomba district.

The introductions during the year were:—

Anacardium occidentale
Bassia latifolia
Cassava varieties
Jamaica No. 2
,, No. 3
,, No. 4
,, No, 5
Basiorao No. 279

Soil Science and Chemistry.

41. Work on soils has been directed chiefly to two soil types, found at the Likuni and Chimvua Experimental Station of the Native Tobacco Board, which are representative of tobacco soils in the Lilongwe district. A detailed survey of these soils has been carried out, fertiliser experiments at both stations started and detailed laboratory work on the soils is in progress.

A variety of tobacco soils was studied by the Assistant Director and Chemist during his visit to Rhodesia and samples were investigated on his return to Zomba.

The routine work of the laboratory has been carried out, and various analyses have been made for, and advice given to, both members of the Department and planters. The Veterinary Department has been supplied with decinormal iodine and specimens from suspected cases of dip poisoning, have been tested for arsenic.

Staff.

42. The following were on leave during the year: Entomologist; Assistant Chemist; Office Superintendent and Secretary, Native Tobacco Board; Mr. R. W. Kettlewell,; Agricultural Officer; and Messrs. E. E. Carral-Wilcocks, G. D. Hayes and Major D. N. Smalley, temporary Agricultural Supervisors.

Mr. R. Leach, Plant Pathologist, procceded on leave on April 16 pending retirement on August 7; Mr. C. W. R. McCreary, Agricultural Officer, arrived on October 13 on first appointment; Mr. C. C. Webster, Agricultural Officer, arrived in Nyasaland on transfer from Nigeria on December 3; Mr. A. D. Souter, temporary Agicultural Supervisor retired on September 1, Mr. J. E. L. Fenner was appointed locally as temporary Agicultural Supervisor as from September 1; Mr. R. Neil was appointed Clerk on July 1; Mr. J. A. Gray, Junior Clerk, was transferred to the Education Department as from August 2. Mr. G. T. Stafford, Senior Clerk, acted as Office Superintendent and Secretary, Native Tobacco Board, from January 1 to February 7.

Part III. Financial Statements. Agriculture.

43. The following statements show the expenditure and receipts of the Department in 1938.

Expenditure

	Approved Estimate	Amount spent		
	£	£	s.	d.
Personal Emoluments				
European	10,496	10,690	19	2
Native Staff	1,211	1,155	3	4
Other Charges				
Transport	2,064	2,193	12	4
Travelling	13	13	16	9
Passages	997	911	1	—
Experimental Work	1,206	1,205	2	3
Distribution of Cotton Seed	1,600	675	19	5
Botanic Gardens	45	45	3	7
Contribution to Agricultural Show ...	120	120	—	—
Treatment of Plant Diseases, Tobacco Pests, etc.	150	76	15	7
Library	50	45	7	7
Tools and Equipment	250	250	3	9
Seeds and Plants	50	20	1	11
Incidentals	20	15	11	9
Uniforms	81	64	6	8
Cotton Seed Stores and Markets	190	35	6	8
Cotton Seed Bags	50	196	14	5
Upkeep of Boat	30	5	4	2
Contribution towards Upkeep of Experimental Stations (E.C.G.C.)	325	325	—	—
Transport (E.C.G.C.)	300	477	5	2
Contribution to Native Tobacco Board ...	540	540	—	—
	19,788	19,062	15	6
Special Expenditure				
Anti-Locust Campaign	250	—	—	—
Flue Cured Tobacco Experiments ...	—	42	19	8
Two Tents	—	63	1	5
	250	106	1	1
Training of Native Aricultural Instructors				
Personal Emoluments				
Assistant Agricultural Officer	400	—	—	—
Native Staff	285	—	—	—
Other Charges				
Travelling	50	—	—	—
Uniforms	25	—	—	—
	760	—	—	—
Special Expenditure				
Thirty Road Tracers	90	—	—	—
Apparatus	50	—	—	—
Typewriters	25	—	—	—
	165	—	—	—

	Approved Estimate	Amount received
Revenue	£	£ s. d.
Sale of Agicultural Produce	530 ...	568 4 11

Part IV. Summary of Legislative Changes Affecting Agricultural Industries during 1938.

44. The Marketing of Native Produce Ordinance, No. 14 of 1938, was passed during the year but has not yet come into force. It aims at controlling the sale and and purchase of native produce in order to obtain better prices for the native by means of more organised marketing and at reducing the risk of food shortage which now not infrequently occurs as a result of rash selling by the native soon after harvest. The Ordinance provides that the purchase of native produce grown on Trust Land may be controlled and regulated in any area the Governor may prescribe and for any specified crops. Purchases may only be made under licence and the Governor may make rules regarding the use of markets and market building, prescribe the grade or quality of any specified native produce which may or may not be sold, etc.

The Tobacco (Amendment) Ordinance, 1938, gave the Governor in Council power to suspend the operation of any part or section of the Tobacco Ordinance (Cap. 65).

Under the Tobacco Marketing Ordinance 1937, rules were made during the year for buyers and sellers of tobacco on the auction floors, and for owners of licensed auction floors.

Acknowledgments.

45. I desire again to express my thanks and those of the Department as a whole to all those bodies and individuals who have assisted us in our work during the year. In particular to the Empire Cotton Growing Corporation staff with whom close touch has been maintained and whose advice and assistance in cotton matters are always welcomed. To the Tobacco, Tobacco Exporters, Tea and Tung Growers Associations. To the British Cotton Growing Association and to the Imperial Institutes of Entomology and Mycology and the Imperial Bureaux.

Much help has been given by administrative officers and by members of the farming community to all of whom we are grateful.

The staff of the Department have given their best particularly during the period of great pressure due to the new tobacco marketing system when long hours were willingly worked and to them all I express my gratitude.

D. L. Blunt,
Director of Agriculture.

Part I (a).

Report of the Assistant Director of Agriculture and Chemist.

Tobacco Marketing. In 1938 the sale of much of all types of the tobacco crop of Nyasaland by the auction system was instituted. In the case of flue-cured tobacco this was made compulsory with the consent of the great majority of those engaged in its production and the necessary legislation was passed in Council on December 16, 1937. In the case of dark-fired and dark air-cured tobacco grown on unalienated Native Trust Lands, this was provided for by Native Tobacco Board Rules, made under the Tobacco Ordinance of 1926. It will be noted that the sale of certain types of air-cured and any dark tobacco grown on alienated Native Trust land was not made compulsory.

It is considered however that the introduction of the method of auction sale of flue-cured tobacco and dark tobacco from unalienated Native Trust Land has been of benefit to the industry. Certain growers have doubtless suffered as compared with what they received under the old systems but the majority benefited and there was an increase in the average price received for the *whole* crop sold by nearly all growers of flue-cured. It is also considered that the 1938 crops of native growers sold on the auction floor received a much higher price than they would have done if the old marketing system had continued. The average price for each grade was also maintained throughout the season.

It is naturally hoped that all tobacco sold by auction during the coming season will be sold at remunerative prices. Some apprehension will be expressed at the large increases in exports of flue-cured tobacco from Empire sources to the United Kingdom. Such increases in 1938 from British India, Canada and Southern Rhodesia made a total of 24 million lb. over the imports during 1937. Indeed the total imports of all tobacco into the United Kingdom during 1938 were over 210 million lb. making an increase of 71 million lb. over the imports of 1937. Such sudden increases cannot but have a greatly disturbing influence on the market and if average prices in the auction markets of Southern Rhodesia and Nyasaland are reduced this factor can be held largely to blame and the system of auction marketing cannot be condemned.

It may be asked why the auction system was not introduced into Nyasaland before 1938 as discussions have often taken place since the writer returned from the U.S.A. in 1926. However when acting Director of Agriculture and Chairman of the Native Tobacco Board in 1937 he saw that the time had arrived to strike the iron while it was hot, the iron not having been become even warm during the previous six years.

It is interesting to trace the course of events in the inauguration of the compulsory sale by auction as it is considered that this was done with a rapidity which reflects great credit to all the officers concerned and the writer desires to put on record the sympathy and help he received from His Excellency the Acting Governor at that time.

It may now be said that it is regrettable that the system was not introduced when the flue-cured industry was on a much firmer economic basis, when there were many more flue-cured growers and Nyasaland brights were definitely 'on the map'.

However the present campaign commenced at a meeting of the Native Tobacco Board on June 25, 1937, when it became clear that a lead must be made with the marketing of dark tobacco from unalienated Native Trust Lands. A round table conference at Zomba comprising all interests concerned in this crop and a combined meeting of the Native Tobacco Board and the Tobacco Exporters' Association with representatives of the Tobacco Association and Northern Province Association at Limbe, both in August 1937, agreed to the creation of auction floors and such receiving and buying stations as might be necessary subject to the approval of His Excellency the Acting Governor.

At this stage the writer desires to express his thanks to Mr. S. S. Murray, the Nyasaland representative at the East African Trade and Information Office, who had been invited out at his instigation by the Nyasaland Tobacco Association and who gave great assistance at the above conferences and in carrying on at various meetings the campaign for the auction sales of flue-cured.

Many more meetings involved the old Tobacco Control Board and special committees of the Tobacco Association who advised on the legislation required and the formation of a public company to conduct the operations on the warehouse floors for the sale of tobacco by auction.

Little more need be said as these operations were very efficiently carried out, the legislation required, as has been indicated, being passed in November. Furthermore all the dark-tobacco grown on unalienated Native Trust Lands was purchased from growers in a satisfactory manner, baled and forwarded to the warehouses at Limbe and Lilongwe.

The writer was present at many of these purchases as a representative of the Native Tobacco Board and at all the sales by auction in that capacity and as Chairman of the Tobacco Control Board.

He desires to place on record the very pleasant relations which existed at all times between the tobacco buyers, the directors and staff of Tobacco Auctions, Ltd., and himself. He considers also that both the permanent and temporary staff of the Native Tobacco Board engaged at Buying and Receiving Stations worked very hard to make the whole scheme a success. To all of these he feels a deep sense of gratitude.

PART I (*b*).

Work of the Tobacco Control Board.

Under the Tobacco Marketing Ordinance, 1937, a Control Board was established on December 23rd, 1937 and the first meeting was held on January 17th, 1938. The writer was elected Chairman and during the next few weeks the Board was busily engaged in giving effect to all the regulations for marketing flue-cured tobacco by the auction system of sales. Furthermore in section 10, which dealt with the licensing of premises for the sale of tobacco by auction, the fixation of tariff of weighing, selling and commission charges, of minimum prices and the rendering of certain returns, tobacco included all classes and types of manufactured tobacco that may be offered for sale on any licensed auction floor.

Seven meetings had to be called before the licensed auction floors were opened for the sale of tobacco on April 4. These involved a great deal of business and the writer is indebted to the following appointed members for their great help in so rapidly evolving the machinery for the efficient sale of tobacco by auction.

Nominations of the Nyasaland Tobacco Association	T. M. Partridge, Esqr., O.B.E. A. M. Henderson, Esqr. G. V. Thorneycroft, Esqr.
Nominations of the Nyasaland Tobacco Exporters' Association.	The General Manager of the Imperial Tobacco Company or his Deputy C. A. B. Barton, Esqr.
Nominations of the Governor in Council of Members of the Native Tobacco Board	The Treasurer The Senior Provincial Commissioner

(Officer of the Agricultural Department—Capt. A. J. W. Hornby, M.B.E.).

The work of the Board can now be considered in more detail, bearing in mind the special application of section 10 mentioned above.

Finance. Beyond the revenue of the Board from licences and fees for valuation, which is necessary to defray current expenses, the Board can call upon funds which have been paid in by exporters to a cess fund held by Government. (Tobacco Cess Ordinance 1934). The Board employ a Secretary who not only attends to the finance and prepares an annual balance sheet for audit but also attends to the large amount of correspondence involved in the operations of the Board.

Moreover during the buying season the clerical work slackens so that it has been found that the Secretary can combine two posts, the other involving that of Sales Supervisor. This has been found economical and expeditious in the contacts he makes with buyers, sellers and the management staff of the auction floors.

Registration and licensing. All growers of flue-cured tobacco must register annually in accordance with the provision of the Ordinance.

All buyers must be licensed annually, the provisions of such licences being explicitly stated in the Ordinance.

The premises deemed suitable by the Board for the sale of any tobacco by auction and usually referred to as auction floors are licensed.

Furthermore any flue-cured tobacco leaf used for the purposes of manufacture for sale in Nyasaland must be bought on auction floors unless it is scrap or grown by the manufacturer himself. Such manufacturers must be registered and written permits are issued on the authority of the Board.

All the above registrations are received and acknowledged by the Secretary at his office in Limbe. The licences and permits mentioned above are also granted by him under the authority of the Board.

Period and Time during which tobacco is offered for sale. These are appointed by the Board and the dates fixed for opening auction floors are well advertised for the information of sellers and buyers, the latter both in Nyasaland and the United Kingdom. The Sales Supervisor keeps in close touch with sellers and buyers and fixes the time of commencement of sale each day and the days of the week on which sales are justified by the amount of tobacco coming in.

Rules. Under Part III. of the Ordinance, the Board has power, subject to the approval of the Governor in Council, to control and direct the procedure in regard to the sale of tobacco on any licenced floor, and for that purpose to make rules.

The Board have therefore made rules to be observed by owners of auction floors, rules to be observed by buyers, and rules to be observed by sellers of flue-cured tobacco.

Furthermore they have issued written instructions to the Supervisor of Sales to see that such rules are complied with. These instructions also define his duties regarding supervision of bales, placing thereof and rate of sale. He has power to examine weighing machines and other machinery and to ascertain quantities and average prices of all types of tobacco.

Returns. The owner of a licensed auction floor must render prescribed returns of sales to the Secretary. These give information concerning the quantities of flue-cured tobacco purchased by each buyer and whether the tobacco is for protected, local or other market. The average price for each day is also known.

Further to these a Committee of Government officials appointed by the Governor in Council have prescribed certain confidential returns which buyers must render concerning purchases, their prices above or below the minima fixed by the Board and the total exports of leaf and strips to various markets.

Minimum prices. It will be noted that the Board have power to fix different minimum selling prices for tobacco of different classes or types and for each class or type may fix different minimum prices for different markets. The minimum prices so fixed shall not exceed threepence per pound weight for any protected market. The Board is so constituted that its knowledge of markets enables it to fix fair minimum prices for local, protected and other markets for any dark or bright leaf or strips.

Permits. The Board can permit the sale on licensed auction floors of any type of tobacco other than flue-cured tobacco, but buyers only require a permit to export flue-cured tobacco which is issued by the Secretary under authority of the Board. This permit states the quantity of tobacco which is authorised to be exported, the country of destination and the period for which it is valid.

The Board have also power to issue permits to growers of flue-cured to export tobacco direct to protected markets, but it has power to inspect and value such tobacco. If the valuer appointed by the Board is of the opinion that the value per pound weight is less than the minimum price fixed for tobacco of that class or type, he can refuse to issue a certificate in which case the Board do not authorize a permit.

The Board moreover have adopted a policy of not granting permits to any applicant who had not been in the habit of consigning tobacco during the previous three seasons. The average of the previous three seasons is taken into consideration and each case is considered on its merits.

It may be emphasised that if any seller is dissatisfied with the price he is receiving for certain grades and withdraws them from sale and furthermore he can produce good evidence to the Board that he is likely to get a better price when shipped on consignment, the Board will consider favourably the granting of permits.

As regards manufactured tobacco for local consumption, the Board issue written permits to registered manufacturers to engage in such activities.

Pool. Under Part II. of the Ordinance the Board has power to establish, carry on and control the tobacco pool and to appoint a Committee of Management. Every grower of flue-cured shall contribute to the pool all tobacco surplus to that required by him for the local market or for export under permit or sold on any auction floor.

So far it has not been found necessary to establish a pool but certain growers may combine to form a voluntary pool of scrap which, under section 12, need not be sold by auction. It may considered that such a pool handling all scrap would ensure a better deal from local manufacturers.

Miscellaneous powers. The Board also under Part III. of the Ordinance has miscellaneous powers to appoint such persons as it considers necessary to enable it to exercise its functions. As a body corporate it can acquire property.

It can prescribe forms and fees.

Furthermore it can incur expenditure on the furtherance of any scheme for the better marketing of tobacco or for the development of overseas markets and for the purpose of developing new markets to buy tobacco for exhibition or sale.

Naturally in the Ordinance there are sections dealing with appeals from decisions of the Board, with offences and penalties.

Also for protection of persons acting under this Ordinance.

So far the Tobacco Control Board have had no offences of any kind to report and the machinery has worked smoothly and well.

Part II.

(*a*) Work was done during the year on the ecology of various areas with a view to the better understanding of natural vegetation in its relation to soil and environmental factors. During my visits to Northern and Southern Rhodesia during the year I took the opportunity to discuss with officers of the Departments of Agriculture various ecological matters. It is clear that in all three countries there are large areas with similar conditions of climate, with soils of similar physical properties and chemical composition and where the development of native agriculture would proceed on similar lines.

I would like to place on record that the discussions were helpful and stimulating and that in many agricultural and ecological matters closer co-operation would be of advantage to many officers.

Grasses from various soils were collected during the year under my supervision and, where necessary, were forwarded to the Royal Botanic Gardens, Kew, for identification.

(*b*) The Agricultural Survey of the five most northerly districts, often referred to as the 'dead north,' was completed during the year. I edited the report and contributed several chapters on the climate and agricultural zones which included data I had collected in past and recent tours.

(*c*) Fermentation problem of tea in the high rainfall belt of Mlanje.

Reference may be made to my Annual Report for 1935 for the results of my earlier work on this problem. Since that period it must be affirmed that spraying of large areas of tea-bushes which give leaf which ferments very slowly or hardly at all has given good results and has been profitable. The dilute solution which I eventually recommended was of copper sulphate and gave up to 1938 great improvement in fermentation and quality of tea.

It must be remarked that the late Mr. C. F. S. Shaw, Manager of Lujeri Estates up to 1936, maintained that the tea bushes in question which in the early days of experimentation were not in full bearing would eventually give leaf which would give a normal fermentation.

This view has been borne out in 1938 as tea from the soils all over the high rainfall belt has fermented well. Frequent observations will be continued on this area to ascertain whether the improvement is temporary or permanent.

I desire here again to place on record the help I have received from Messrs. the Imperial Chemical Industries. At their Research Station at Jealott's Hill, full analyses of tea and soil samples which I forwarded to them were carried out by a special method. A correlation was found to exist between cobalt content and good fermentation and it may be that the cobalt sulphate which occurred in the copper sulphate was the active agent in the improvement in fermentation which was obtained during the past four years. If this improvement is not maintained, arrangements will be made for further experiments with cobalt and copper compounds applied in spray solutions.

(*d*) During November and December I visited Northern Rhodesia to report on the production of tobacco in the Northern Western areas. I found the tours pleasant and interesting and desire to place on record the assistance, hospitality and co-operation I received on various agricultural matters from the Director of Agriculture and his co-workers.

A. J. W. HORNBY,
Assistant Director of Agriculture and Chemist.

Report of the Entomologist.

Owing to a long leave in England falling due, and a visit paid to Uganda on the return journey, I was absent from the Protectorate from the middle of March until the end of the year.

During February I accompanied Mr. H. W. Parsons, E. C. G. C. Barberton, Natal, on a tour of investigation between Nkwale Experimental Station (E. C. G. C.) Dowa district and the Lower Shire district to select sites for, and set up if possible, the apparatus required in the investigation of the pupal period of the Red bollworm of cotton (*Diparopsis castanea*, Hmps.), which it had been decided was the first study to be undertaken by the Entomologist, Mr. B. L. Mitchell, to be appointed to the Empire Cotton Growing Corporation Staff in Nyasaland.

During the voyage home it was interesting to find evidence of the presence of Eucalyptus Snout-beetle (*Gonipterus scutellatus*, Gyll.) and its egg-parasite (*Anaphoidea nitens*, Gir.) in Lourenco Marques, which adds to the knowledge of the distribution of this weevil in Africa. (c.f. Annual Report 1937, p. 23). A note of this discovery was sent to the Editor, The East African Agricultural Journal and published in Vol. III. No. 6 May, 1938.

While on leave I attended, as one of the British Empire delegates, the VIIth. International Entomological Congress held in Berlin and Munich from 15 to 22 August; and the Vth. International Locust Conference held in Brussels from 23 August to 1 September, as an advisor attached to the British Empire delegation. I also attended the Empire Cotton Growing Corporation's conference held in London on 22/23 September.

My visit to Uganda, arriving at Kampala on 25 November and leaving on 19 December, was, perforce, somewhat influenced by the fact that the agriçultural laboratory staff were in the process of moving to new laboratories and quarters at Kawando. My very grateful thanks are therefore due to the Uganda Government for providing me with transport; to Mr. A. S. Thomas, Botanist, and to Mr. E. Williams, Agricultural Officer, for transport and accompanying me on various journeys; to the staff of the Serere cotton experimental station for hospitality at short notice; and particularly to Mr. H. Hargreaves, Senior Entomologist, for accommodation, arrangements and valuable entomological information under the difficult circumstances of having his collection and records distributed between two different places.

I was fortunate in making contact with Dr. H. C. Taylor in the Bugishu district, as this entomologist has carried out the most recent work on Pink bollworm of cotton (*Platyedra gossypiella*, Saunders.) in Uganda and is now engaged on a study of the Cameron Bug (*Antestia* sp.) on native-grown coffee.

In this report it will suffice to say that the information from Uganda indicates that: in the case of Pink bollworm on cotton a *dead season* of 2—3 months should be aimed at, and that the present extensive sowing period is considered to be longer than is necessary or desirable for the production of a satisfactory crop: in the case of *Antestia* on coffee greatest control is exercised by a Tachinid fly parasite that normally inhabits rather dense forest areas and thus the simulation, with circumspection, of such conditions in native coffee areas should prove beneficial.

A visit was also paid to the developing Kajura tea estates in the mountain-grass land area of Toro.

Crop Pests.

Tea: During the year an outbreak of Gelatine Grubs, the larvae of a Limacodid moth, probably *Niphadolepis alianta*, Karsch., occurred on a few tea estates in the Cholo district.

The outbreak was not observed until the middle of May, by which time it had reached its peak. The Agricultural Officer, Mlanje, studied the pest as far as circumstances allowed and made recommendations for pruning and burying or burning the prunings of the infected area, which appeared to give some relief. It is apparent, however, that early broods in January or even before had developed unobserved and were responsible for the serious infestation in May. Although the pest appeared to be confined to a comparatively small area in the vicinity of the Cholo boma, it was found to be present on three separate estates from one of which some 20 larvae were reported

as being found on a single tea bush in May 1936. Prior to this, only isolated individuals had been seen in various parts of the Protectorate, mainly on coffee, although a few specimens were bred up from tea in Mlanje ten years before, to which passing reference (without identification) was made in the Annual Report, 1926. (p. 14). From available information it appeared that almost identical caterpillars in other tea growing countries had never developed into pests of tea and it did not seem necessary, in 1936, to view this particular Gelatine Grub with suspicion. The important Nettle Grub caterpillar pests of tea have not yet been recorded from Nyasaland.

The view must now be taken that the indigenous *Niphadolepis* Gelatine Grub has established itself, at any rate in the Cholo district, as a tea pest of some importance and will possibly require attention year by year if it is to be kept within normal bounds. It is not possible, as yet, to give any information as to the effect of climatic conditions on the occurrence or suppression of outbreaks.

Coffee: Cameron Bug (*Antestia* sp.) was reported to have done much damage to the crop in the Masambanjati area.

Locusts.

The red-winged locust, *Nomadacris septemfasciata*, Serv., continued to be the only species reported in the country.

The almost complete absence of egg-laying and consequent hopper development during the breeding season of 1937-38 was commented upon in the last Annual Report. Thus a very few and scattered hopper bands of the 12th generation appeared to exist only at the most southerly end of the Protectorate and in the eastern part of the Upper Shire district during the January—March period, those in the former area being destroyed during February but some escapes occurring in the latter area.

From March to July very few adult swarms of the 12th generation were recorded throughout the Protectorate. In April only one swarm was reported, moving from the Chikwawa district into Portuguese East Africa. During May a swarm circulated near Fort Manning, coming from Northern Rhodesia and re-entering the Fort Jameson district of that territory. Two others only were reported moving north through the eastern part of the Upper Shire district, presumably developed from the hopper bands mentioned. In June a further single swarm was circulating near the Namitete river in the south of the Fort Manning district but returned into adjacent territory.

During the last week of July several swarms appear to have invaded the west and south-west parts of the Mlanje district, which was the only district to report swarms during the month. It is clear that a renewed activity of swarms, possibly a re-invasion, was taking place this month as during August all districts as far north as Blantyre, with the exception of Chikwawa, reported a few flying swarms. One swarm again crossed the south-west corner of the Fort Manning district

The same districts in the south recorded swarms during September and October, and in the latter month the Chikwawa district was invaded for, apparently, the first time.

During November circling flights continued in these districts, some large swarms being reported.

In December a few swarms were moving further north and were passing through the Upper Shire, and South Nyasa districts.

Egg-laying (13th generation) was recorded early in December in most of the southern districts containing swarms towards the end of the month and early in January 1939 in the more northern districts.

Hoppers (13th generation) first hatched near Chiromo in the Lower Shire district on 29 December.

Some damage to early maize crops by these 12th generation adult swarms was recorded from the higher elevations during the latter end of the year.

Once again the infestation appeared to confine itself to the southern part of the Protectorate, the country lying north of Lat. 14°S. remaining free.

Colin Smee,
Entomologist.

ACKNOWLEDGMENTS.

Recent identifications, for which thanks are due to The Imperial Institute of Entomology, include:—

Curculionidae.

Systates hystricodes, Mshl.	Cotton.	North Nyasa.
Systates nocivus, Mshl. sp. n.	Coffee.	,, ,,
Blosyrus manicanus, Mshl.	Cotton	,, ,,

Meloidae.

Mylabris kilwana, Vgts.	Maize.	Zomba.
Mylabris tettensis, Gerst.	Potato Creeper.	Dowa.
Cylindrothorax (Epicauta) strangulata, Gerst.	Beans.	Zomba.

Galerucidae.

Monolepta (Candezea) gossypii, Bry. sp. n. Ratoon Cotton. Nkwale.

Eumolpidae.

Colasposoma instabile, & var, Har. Nectarines, Mlanje Plateau.
Macrocoma apicicornis. Jac. Coffee. North Nyasa.
Rhembastus coffeae, Bry. sp. n. ,, green stems. North Nyasa.

Cassididae.

Acrocassis soror, Wse. Defoliating 'Lagerstraemia.' Zomba.

Thysanoptera.

Haplothrips gowdeyi, Frkl. Oats. Zomba.
Elaphrothrips spiniprivus, Preis. sp. n. Inflorescence of ginger. Limbe. (Dr. Arnold).

CORRIGENDA AND ADDENDA.

Annual Report 1937. p. 24—Snails in Kota-Kota=*Achatina nyikensis*, Pilsbry. Mr. Crawford of the British Museum reported the specimens sent for identification to be very young: the adults reach a length of over three inches.

Annual Report 1935. p. 25.—*Bryocoropsis* sp. n. (Pentatomidae), sucking leaves of *Uapaca kirkiana* and simulating fungoid-like markings, should read *Sahlbergella maynei*, Schout. (Capsidae).

Annual Report 1930. p. 29, l.8 from bottom—*Pseudococcus lilacinus, Ckll.=Ps. citri*, Risso, probably.

Report of the Agricultural Officer, Mlanje Experimental Station.

1. General.

1938 has been an unsatisfactory year in the tea growing areas. The first half was normal but a drought set in at the beginning of August and lasted until almost the end of October. Bushes recovered fairly well from pruning but soon stopped flushing and on estates situated on the edge of the tea belt complete defoliation was common. Both in Mlanje and Cholo light pruned tea came away extremely irregularly which may or may not have been connected with the weather conditions. By December the tea gardens were again flushing freely and making up leeway in respect of manufactured tea. As a result of the drought, however, few estates are likely to attain their estimated yield for the year.

2. Tea Experimental Work.

A. External Experimentation.

a. Mlanje. 1. Lujeri Estate.

It is the custom in Nyasaland to control and stimulate the growth of tea by a system of yearly pruning. The experience gained by Ceylon planters in areas of fairly similar climatic conditions has recently been brought to bear on this system and pruning cycles of from 18 to 36 months have been tried instead of the established yearly one. Soon after this innovation an experiment was laid out to investigate its possibilities and some information on the results over a period of three years follows.

The experiment was carried out on Indian jat planted in 1929. The tea was at first badly affected with "Yellows" and after it came away from treatment it was allowed to grow up to between 6 and 8 feet before being pruned down to 4 inches. In 1935 it was clean pruned and the experiment was laid out after this pruning.

The plots were uniformly cultivated and received a manurial mixture of the following constituency:—

	N.	P.	K.
200 lbs. Sulphate of Ammonia	20	—	—
50 lbs. Concentrated Superphosphates	—	21	—
250 lbs. per acre	20	21	—

This was applied as a pruning mixture in 1935 and a general mixture in 1936 and 1937, all plots received the same treatment.

The tea is planted 4 by 4 feet and the individual plots consist of 120 bushes, i.e. approximately 1/23 of an acre. The layout is a 6 x 6 Latin Square. The following treatments were applied:—

1. Pruned annually, tipped at 4 inches.
2. Pruned as above, tipped at 2 inches.
3. Pruned as above, tipped at 6 inches.
4. Clean pruned 1935, unpruned 1936, tipped at 4 inches (2 Year Cycles).
5. The same as No. 4, tipped at 2 inches.
6. Clean pruned 1935, unpruned 1936 and 1937 (3 Year Cycle) tipped at 4 inches.

The results are represented as a percentage of treatment No. 1, i.e. the yield of made tea per acre from clean pruned tea tipped at 4 inches which is the average estate practice.

Table 1.

Treatment	1935/1936	1936/1937	1937/1938
1	100	100	100
2	87.9	91.5	93.6
3	94.0	85.6	91.5
4	90.0	136.5	101.7
5	99.6	148.2	106.2
6	87.8	128.8	105.9
Sig. Diff. 5% Point	20.9	25.5	13.9
1% Point	25.4	28.7	15.6
z	—	1.5602	.5023
$n_1=5$, ... $n_2=20$ ...	z=.4986 ...	P=0.05 ...	
	z=.7058 ...	P=0.01 ...	

When the results from the first year of the experiment are examined the above table shows that there is no significant difference between the treatments. As the type of pruning is common to all and the difference lies only in the tipping level we can therefore say that no difference in yield due to tipping was demonstrated. In the second year this was confirmed as the difference in yields obviously lay between the pruning treatments and not the tipping levels. The table also shows that the difference between the clean pruned tipped to 4 inches and the clean pruned tipped to 6 inches was outstanding but not great enough to be significant. In the third year of the experiment the clean pruned tipped to 6 inches (No. 3) gave a significantly lower yield than the unpruned tea tipped to 4 inches (No. 6) and the pruned tipped to 2 inches (No. 5). It therefore can be stated that under the conditions of 1936/37 tea left unpruned for one year and tipped either to 2 or 4 inches gave a significantly greater yield (5% point) than tea tipped to 6 inches and pruned every year.

The experiment error was high and if a uniformity trial has been performed before the treatments were applied the error would probably have been reduced and would thereby have given greater precision in the estimation of the effects of the different treatments. When the 1936/37 results were corrected for the 1935/36 results it was shown that the treatment differences were not sufficiently wide apart to conclude that tipping treatment on the unpruned tea had a cumulative effect over two years. The yields as far as tipping levels are concerned show no definite tendency in any one direction, except that the estate practice (4 inches tipping) usually gave better results.

Thus over the three years period, considering not only the results obtained but also the observation made, there are indications that a 4 inch tipping in a yearly clean pruning cycle and a 2 inch tipping in an extended pruning cycle give the most favourable results.

The interpretation of the pruning treatments are much easier. In the first year there was obviously no difference between the pruning treatments as all plots were clean pruned and any differences were due to the height of tipping. In the second year the unpruned tea gave a greater yield than the pruned tea and the difference was highly significant. The third year of the experiment showed that the two year cycle (No. 5) and the three year cycle (No. 6) still gave significantly greater yields than the yearly clean pruned (No. 3).

The important point is that the unpruned tea produces just as great a yield in the third year as the tea clean pruned every year and produces a significantly greater yield in one case. Now consider the yields in the actual weight of made tea per acre. The fourth column is worthy of special attention.

TABLE 2.

	1935/36	1936/37	1937/38	Total
1	484	641	1,096	2,221
2	423	586	1,026	2,035
3	455	549	998	1,902
4	440	876	1,114	2,334
5	482	950	1,167	2,599
6	425	828	1,161	2,314
Sig. Differences	101	163	152	389

The value of this experiment lies in the fact that it demonstrates that it is an economic proposition for the tea planter to allow tea, under similar conditions, to run for at least three years without pruning. Not only is the yield of made tea increased but the ordinary yearly cultivation expenses are drastically reduced. The cost of two prunings and of the necessary operations which always follow is saved and cultivations are reduced due to the effect of the shade on the weed growth. Even with a poor growth of weeds, however, it is not advisable to allow the ground to become hard and caked and at regular intervals it should be scuffled between the bushes. Just as much attention should be paid to manuring of the tea, unpruned tea can only give its best if it is fed accordingly.

One thing should be borne in mind, that the less frequent prunings in the longer cycles demand extra attention to the initial pruning. All snags and dead wood should be removed and a good clean type of pruning should be practised. It would therefore be wise to allow a large estimate for pruning under such conditions.

It is also obvious that the initial plucking will demand greater care. With a yearly cycle the bushes are easily managed but with longer cycles irregularities in the plucking table when the bushes are getting high will result in a loss of crop. From this experiment it is obvious that it is impossible to have a plucking table with a completely flat surface without great care and supervision, a difficult matter on an estate. It will however, only be on those estates which maintain a level surface that good yields will be obtained in the second and third year.

The question of flowering is of interest and is bound up with the length of the pruning cycle. In the third year after pruning flowering had begun to take place but only on the fringes of the bushes. Such flowering is not likely to affect the yield but if flowering takes place on the branches subtending the plucking surface the yield will be seriously decreased. Such a condition can be alleviated by a gang of pluckers removing the forming flowers and seed.

In Ceylon it has been shown that improved teas may be expected from longer pruning cycles and there is a possibility that this may be the case in Nyasaland.

When applying these results to other parts of the tea growing area two things must be considered and they are, 1. the age of the tea, 2. the rainfall and its distribution.

On the Experimental Station tea planted in 1935 and left unpruned this year suffered very badly from drought, a number of bushes dying. The clean pruned tea in close proximity was not greatly affected and made reasonable growth. It must be remembered that the drought was exceptional this year but there is always the possibility of such a bad season occurring again. This suggests that it is safer to avoid introducing an extended pruning cycle in young tea.

No recommendation can be made as to where such a system would be successful but as a matter of interest the following table has been compiled giving the rainfall and its distribution at the experimental area over a period of 4 years.

TABLE 3.

	1935	1936	1937	1938
January	18.56	9.25	18.89	16.51
February	16.36	17.80	18.35	10.48
March	13.99	32.18	11.34	16.87
April	7.57	9.93	5.92	6.67
May	4.31	2.40	0.99	3.82
June	3.37	3.95	0.91	4.86
July	1.30	4.57	6.53	1.26
August	4.23	2.90	5.25	3.13
September	.44	3.82	2.45	0.00
October	—	4.06	3.43	1.51
November	14.49	9.07	9.32	6.14
December	8.61	12.25	12.19	17.82
	93.23	112.18	95.57	89.07

It is proposed to continue the experiment on Lujeri to investigate how long tea can go without being pruned and the recovery from pruning after different lengths of cycle.

2. Ruo Estate.

A uniformity trial has been completed and the treatment applied in a type of pruning and tipping level trial.

The manurial trial which was discussed in the Annual Report for 1937 has been continued in order to study the residual effects of the different treatments (Sulphate of Ammonia, Sulphate of Potash, Superphosphates and Compost). The pruning experiment also reported in 1937 has been continued.

When the tea recovered from pruning this year it was decided to carry out an investation into the yield of the individual bushes which go to make up the yield of the tea garden. Five areas of different ages were chosen on Ruo estate on "Local" jat and on Lujeri estate two areas were chosen, one of old Indian and one of "Local" jat which had been treated extremely well. A series of young Indian bushes were examined on the Experiment Station. The results will be published next year.

b. Cholo. Nchima, Namingomba and Mandimwe Estates.

As the conditions of the Cholo tea area differ from those in Mlanje it was decided in 1937 to arrange a series of experiments, in collaboration with the estates, on the same general lines as those in Mlanje. The following have been started :—

1. Time of pruning experiment on both Indian and " Local " jat.
2. Extended pruning cycles experiment also on Indian and " Local " jat.

Uniformity trials have been completed in the first series of experiments and the appropriate treatments applied. The uniformity trials for the second series have just commenced.

B. *Mlanje Experimental Station.*

a. The first series of uniformity trials have been completed and treatments have been applied. The following aspects of tea culture are under investigation at the moment :—

1. Inorganic and organic manures.
2. Time of application of artficial manures to tea.
3. Pruning methods throughout a pruning cycle.
4. Trial of Genzymic Manures.
5. Leguminous and non-leguminous green manures with and without artificial manure.
6. Different intensities of plucking.

Two more uniformity trials have been commenced and it is proposed to study the effect of cultivation and selective weeding on tea.

b. On the station a number of the main drains were stoned and stone retaining walls are being built where the station land abuts on estate roads. 3000 trees were planted up to form hedges which will demarcate the boundaries and the individual experimental areas. Land has been obtained for the formation of a settlement with gardens for the permanent staff on the station, this will be opened up in 1939.

The estimated yield of 500 lbs. of made tea per acre was obtained and yields of more than 1000 lbs. per acre of made tea were recorded from some of the experimental treatments.

The estimated yield for 1938/39 is 600 lbs. per acre of made tea.

c. A number of indigenous plants suitable for cover crops were collected and established on the station, three of these showed resistance to dry weather conditions and are being tried in the erosion beds. The three successful plants are *Gomphrena decumbens* (Jacq)., *Indigofera multijuga* (Bak) and *Desmodium gangeticum* (D.C). *Gomphrena decumbens* (Jacq.) although non-leguminous is the most promising at the moment as it is extremely hardly and may form a useful plant for the stabalisation of bunds.

d. Fermentation. Fermentation tests were performed in connection with the investigation into the problem of poor fermentation of tea leaf from certain soils in Mlanje on behalf of the Chemist and the Assistant Chemist.

e. Maize Storage. Samples from a number of estates were examined and advice was given in respect of storage.

3. District Work.

Visits were paid to European Planters at their request and all Native Agricultural Shows were visited in the district but little time was available to extend this work.

4. Tea Pests.

Pests were more serious than usual in the tea area this year which may have been due to the adverse weather conditions.

In the absence of the Entomologist on leave an investigation was undertaken in Cholo on the Gelatine Grub (*Limacodidae : Niphadolepis alianta*, Karsch) on tea.

Distribution. The grub was found to be centred around the Cholo Boma and was recorded on Nchima, Bandanga and Mboma. To the best of the writer's knowledge the pest did not cross the Nswazi River to the south and has not been reported beyond the fourth mile stone on the Cholo-Limbe road.

DESCRIPTION.

Moth. Of a general golden-brown colour: expanse 2-5 cms. Rarely seen.

Eggs. Probably flattened, oval and scale-like: about 1 m.m. long: laid singly.

Larvae. Oval in shape and blue green in colour. The head is concealed and the legs are not apparent. The larva has a slug-like motion. The smallest collected were .28 cms in size and these grew to at least 1.38 cms—the time taken varying between 3 and 6 weeks. Before changing into the pupal stage the larva becomes white and opaque.

Pupae. Cocoons containing the pupa were found attached to the underside of old leaves, in axils of leaves, on the stem and most frequently on the ground at the base of the bush at the peak of the infestation. Under a dense cover of vegetation the cocoons were found on the surface of the leaves, which is probably the normal position. The cocoon is brown in colour and is marked by white silky-threads that attach it to the tea bush or to particles of soil. The cocoon is about 1 cm. in length.

LIFE HISTORY.

Little data was collected on this subject due to the difficulty of obtaining the mature moths from the cocoons. Under controlled conditions the first moth did not hatch for 107 days after the formation of the cocoon, and generally hatching occurred in a most irregular manner. Different environmental conditions were tried but without success.

HABITS.

The eggs are probably laid singly, dotted about on the leaves of the tea bush. The very young grubs on hatching begin to feed on the surrounding leaves and gradually devour everything. The grubs worked upwards and after a period of from 3—6 weeks reached a mature stage. In this time between 5 and 8 full size "Indian" leaves were eaten per grub. The larvae on turning white became sluggish and decreased visibly in size. At this stage a general movement took place in the direction of the ground where the majority formed cocoons sheltered between particles of soil. A small percentage formed cocoons on the bush itself but this was only in the initial stage of an infestation when there was still plenty of cover. The larvae seemed to prefer shade but fed just as voraciously when exposed to direct sunlight, which happened when the plucking surface was reached. The moth was not captured in the field except when it was about to emerge from the cocoon. All sizes of grubs were found on the bushes and empty as well as full cocoons were common, suggesting constant egg laying and hatching.

DAMAGE.

The grubs seemed to start at the bottom of the bush eating the old leaves and gradually worked upwards. Eventually the flush and tender shoots were devoured. It has already been stated that a grub is capable of devouring from 5—8 leaves in the larval stage and as there were at least 70 grubs per bush on badly infected tea, a tea bush was soon defoliated. This action in itself tended to weaken the bush but the defoliation was followed by a secondary action. The buds in the axils of destroyed leaves were stimulated and began to grow and the grub was therefore responsible for an action similar to pruning. In producing this flush the tea bush must have drawn on the reserve food in its roots. This would not matter to any extent providing the tea bush could be pruned right away but with an estate-wide infestation this was impossible and in one case, before the bushes were pruned, a new cover was being formed. Eventually the bushes were pruned and the plants again had to draw on their already depleted reserves to produce new shoots and leaves. It is obvious that the bushes will be weakened and the real effect of the pest will only be apparent when the attacked bushes recover from pruning. On one estate the bushes which had been seriously attacked could be picked out when they had begun to recover from pruning by the absence of leaves, except on and near the plucking surface. Even if the attacked bushes were pruned before they became defoliated the reduction in the effective leaf area must be reflected in the reduction of the food stored in the roots. It must also be remembered that this defoliation took place at a time of adverse weather conditions.

EXPERIMENTAL CONTROL.

A series of experiments were set up to investigate methods of control.

1. Effect of pruning and leaving the prunings lying on the ground.

The larvae continued to feed on the withering prunings for as long as 26 days. The prunings by this time were brown, hard and leathery. This period allowed a large percentage of the larvae (in experiment = 60%) to complete this stage of their life history and form cocoons, a condition in which they were able to withstand adverse weather conditions. The larvae did not move for the first 7 days but as time went on there was a general movement away from the dead prunings. This demonstrates that pruning a large area and leaving the prunings exposed to the sun will not be a control as a large percentage of the larvae manage to survive long enough to form cocoons and there is a definite tendency to migrate to another area.

2. Pruning and burying the prunings.

A series of tins were arranged each containing a constant number of grubs buried in a manner similar to the burying of the prunings on an estate. A parallel set of tins was also set up containing cocoons instead of grubs. Every seven days a tin of each series was examined and a count made of surviving grubs and cocoons.

The results were as follow :—

TABLE 4.

Date of examination	Percentage of Grubs Dead.	Percentageof Grubs Dead in Cocoons.
2—6—38	60	—
9—6—38	80	—
17—6—39	100*	—
24—6—38	100	20
1—7—38	100	30
1—9—38	100	60†

*1 pupated. †moths emerged in soil and dead.

The results indicate that if an attack is over a comparatively large area the best control is to prune all the area and immediately bury the prunings. Grubs are killed easily unless they have almost completed the larval stage but even these are liable to be destroyed either in the cocoons or when they emerge as adults. The cocoons are highly protective but grubs inside them seem to die if they are not dug up again. Two points must be remembered when considering this method.

a. To be successful the prunings would have to be buried immediately (the same day if possible), which means that a large amount of material with a high carbohydrate content would be incorporated in the soil. Such material is liable to be attacked by *Armillaria* and act as a focus for the infection of the tea in the immediate vicinity. In a bad *Armillaria* area this scheme might lead to an outbreak of the disease.

b. The boys burying the prunings must not be allowed to dig a hole every few yards and pack a large bundle of prunings into it, as very often happens. The prunings must buried in small quantities. A large mass of green material suitably aerated would allow a high percentage of grubs to pupate and when the material collapsed emerging moths would be able to escape.

3. Possibility of alternate host plants.

In order to investigate the possibility of an alternate host the commonest weeds (including *Alternanthera*) growing under the attacked tea were offered to the grubs under controlled conditions. In all cases the grubs refused to feed and all died.

Grubs were found in Cholo feeding on Rose bushes so a number of selected plants with leaves not unlike tea were offered and in all cases they fed voraciously and pupated.

Another set of experiments was then set up to find if the grubs had a preference for any one kind of plant and with the plants to hand the grubs preferred Coffee and Tea; when only offered these they showed no preference.

These experiments demonstrate that although the grubs will not eat herbaceous plants they may have a range of host plants in the shrubs and tree group. This suggests that although the grubs have not an alternative host in tea gardens they might quite well have one in the bush surrounding them. A brief search did not reveal the pest but it may nevertheless be there.

4. Pruning, removing and burning the prunings.

The possibility of pruning, removing and burning the prunings and collecting the cocoons from the bush and from the ground in the vicinity was investigated. This method was tried in a small area and it was completely successful. It is obvious that this could not be applied to the whole estate when an infestation has reached its peak, as the labour requirements would be out of the question. Therefore collecting early in the season is imperative.

5. Discussion.

The pest was not observed until the month of May by which time it had nearly, if not quite, reached its peak. The grub attack on the estate under observation began in isolated places and gradually spread all over. This suggests that the best way to control this pest is to eliminate the grubs in the initial stages when they are in reasonable numbers. The chief difficulty lies in being able to observe the initial attack. Under unpruned tea the only manifestation of the attack is the presence of a large quantity of excreta beneath the attacked bushes. It is not until the grubs reach the plucking surface that the symptoms become obvious and by such a time the attack has become general.

When the pest is widespread the only thing to do is to prune and bury the prunings immediately.

NATURAL CONTROL.

In the badly infected areas there was an accumulation of crows which fed on the grubs and also hunted for cocoons on the ground. The crows must have been quite an important factor in the natural control of the pest.

No natural parasitism of the pest was observed.

Red Spider (*Tetranychus bioculatus*, W.M.) Was extremely serious this year and wide spread on both Indian and "Local" jat. Spraying was universal but the attack was so intense that by the time the average estate had finished one spraying round the first sprayed tea was almost as heavily infested as ever. Even a month after the onset of the rains infestation of Red Spider were still common.

Mosquito Bug (*Helopeltis bergrothis*, Reut) did little damage either in the nursery or in the field.

White Ants (*Acanthotermes militaris*, Hagen.) have caused a lot of damage in some areas, killing tea supplies and young blue gums. Methods of shading tea stumps with the idea of protecting them not only from the sun but from white ants are being investigated and it is hoped that if a successful method is found it may be applicable to blue gums.

5. PLANT DISEASES.

(*a*) *Tea.* Leaf diseases were prevalent especially Grey Blight (*Pestalozzia Theae*, Sawada), Brown Blight (*Colletotrichum camelliae*, Massee) and leaf scab before pruning when the majority of the estates pluck hard. Some results were obtained on the Experimental Station giving information as to the relationship between intensity of plucking and intensity of leaf disease.

Eye estimates were carried out on an individual bush experiment of seven treatments with 20 replications of each treatment.

The treatments ranged from 1. which was extremely hard plucking to 7. which was light plucking. The estimations chosen for assessing the intensity of leaf diseases were 3 for a severe infection, 2 for an intermediate infection, 1 for a very slight infection and 0 when the bush was free from infection. The figures in the second and third column of table 5 represent the additive assessment of the intensity of infection by leaf diseases on each type of plucking.

The results were as follows:—

TABLE 5.

Intensity of plucking	March	May
1	67	83
2	63	73
3	58	68
4	23	52
5	3	25
6	3	15
7	1	20
Significant difference	2	9
z =	1.7335	1.1948

P=0.01 , $n_1 = 6, n_2 = 114$. z =9.643

These figures suggest that the incidence of leaf diseases increase with the intensity of plucking and just before pruning there is a general increase all round. This year after recovering from pruning there was still an appreciable infestation of leaf diseases and the possibilties of lighter plucking just before pruning may have to be considered if they continue to increase in intensity. The idea must be corrected that when a bush has been pruned it is resting. Recovering from pruning is a definite strain on the bush and a hard plucking of the actively assimilating tissue before pruning is not conducive to a healthy constitution to withstand the strain of regeneration. In the tea areas of Nyasaland pests and diseases have been singularly few but a time is coming when more care will have to be taken with estate hygiene. A few years ago bushes were pruned annually at the onset of the dry weather and thus for a period leaf pests and diseases were without their host and were naturally checked. Bushes are now not only called upon to produce leaf in the off season by a system of early pruning but extended pruning cycles of from 18 to 36 months are becoming more common both of which must facilitate the increase of pests and diseases.

Armillaria has been extremely bad in the young tea (4 years old) on many estates, especially where the tea was pruned early The bushes recovered from prunings and then suddenly the young green shoots began to wither and the bushes died. On one estate 15% of the stand was destroyed.

It was also shown this year that it was dangerous to incorporate green prunings in the soil as the *Armillaria* attacks the wood containing carbohydrates and the prunings act as a focus for the attack on the tea. This substantiates the Plant Pathologist's hypothesis (Annual Report 1936). Green prunings should be left at least 2 weeks before incorporation in the soil in a bad *Armillaria* area and if the tea has been heavily pruned the wood should be removed and burnt. The same precaution should be taken with the incorporation of the loppings from shade trees.

(*b*) *Coffee.* The Masambanjati native coffee growing area suffered during the year from a somewhat severe attack by Cameron Bug (*Antestia* Sp.).

Nematospora Coryli Peglion, which East African Plant Pathlogists in recent years regard as almost positive proof of *Antestia* damage, was isolated from diseased berries. Two bacteria, *Bacterium prodigiosum* [Cohn Lehm and Neum], (*Micrococcus Prodigiosum* Cohn) and *Bacterium herbicola aureum*, Puggeli were constantly isolated from the decaying endosperm as also was *Colletotrichium gloesporioides* Penzing.

The examination of the berries suggested that *Antestia* damage was not the only cause of the condition and a deficiency was suspected. This aspect is discussed in the Report of the Agricultural Officer, Blantyre.

(*c*) *Cassava.* The Cassava stocks in Nyasaland as is the case in most East African colonies are extremely poor due to the incidence of Mosaic. As the potentialities of these stocks in this country were unknown it was decided in May to carry out a survey of the different types and all Agricultural Officers with their respective staffs were asked to collaborate in this undertaking. A simple questionnaire was drawn up and it was suggested that a copy, suitably compiled, should be sent to this station with each type of cassava collected. This questionnaire was designed to give as much information as possible about the relationship in Nyasaland, if any, between environmental conditions and the incidence of the disease.

To date 145 samples have been received and are now established on the station. These will be carefully classified and the more resistant types will undergo an immunity test next year. Thereafter it is proposed to send the most promising types to each Agricultural Officer to be tried in their particular areas and material will also be sent to the East African Agricultural Research Station at Amani.

Cassava types sent from Amani have been established on this station.

(*d*) *Cotton.* The late Lower River cotton suffered severely this year from internal boll rot caused by *Nematospora* (*Ashbya*) *gossypii* Ashby and Nowell. It is interesting to note that bolls examined from the Cotton grown on the higher land and suffering from internal boll rot gave, more often, an isolation of *Fusarium moniliforme* Sheldon (*Gibberella fujikuroi*) (Saw) Wr.) than of *Nematospora gossypii.* As this *Fusarium* is common on Cotton it may only be a secondary organism.

(*e*) *Tung Oil.* With the planting up of new land in Tung Oil the same care must be taken with the stumping and removal of indigenous tree roots as in the case of tea planting. These roots, if left, become heavily infected with *Armillaria* and act as a focus for the spread of the disease to the Tung Oil.

(*b*) *Citrus.* The citrus mottle investigation was continued and a note on the condition issued to planters.

A type of gummosis has been giving trouble on grapefruit this year and the same control measures have been applied as advocated in the West Indies, namely excision of the diseased tissue with the protection of the wounds and in bad cases inarching with rough lemon stocks. The results have been satisfactory.

6. Acknowledgments.

I take this opportunity of expressing my appreciation to J. Lyons and Co. for the use of land on which to carry out the aforementioned investigation on extended pruning cycles and more especially to the Manager, Comdr, E. G. B. de Mowbray, for his valuable collaboration throughout the investigation.

Thanks are also due to the Imperial Institute of Mycology for identifications.

A. P. S. Forbes,
Agricultural Officer.

Report of the Assistant Chemist

General: For the first part of the year I was absent from the Protectorate on home leave. I returned to Zomba on the 13th of May, and proceeded to Lilongwe on the 18th, when I undertook the management of the Native Tobacco Board Experimental Station at Likuni and the Sub-Station at Chimvua, during the absence of the Supervisor, Mr. Jackson, on tobacco buying work.

It was intended to combine a detailed soil survey of both stations with their management, but owing to the amount of supervision required in grading the various tobacco crops, it was not found possible to finish the survey by the time Mr. Jackson returned towards the end of July. I accordingly remained at Lilongwe until the 27th of August to complete the surveys.

Since the 28th of August I have been stationed in Zomba where I have carried out the work of Assistant Chemist.

Likuni and Chimvua Soils. This work was undertaken, and is of importance, on account of the marked difference in the behaviour of the two stations from an agricultural point of view. The most striking difference is the inability of the red soils at Chimvua to maintain their fertility for tobacco while, apparently very similar, soils at Likuni grow satisfactory tobacco, even after many years cultivation.

A preliminary survey indicated that, in spite of the apparent similarity, the soils in question belong to two entirely distinct series or "catenas" and that the slope and elevation of the ground appear to play a very important part in the development of the soils. It may be remarked that both types of red soil cover large areas in the important dark tobacco belt of Lilongwe and contiguous districts. The field work was carried out when I was at Lilongwe. Large scale contour maps were prepared of both stations and the chief types of soil were studied by profiles in 63 pits. The profiles were described in each case and more than 60 characteristic soil samples were taken for future examination.

In view of the time which would be needed to complete the laboratory investigation of the soil samples it was decided to lay-out field experiments, for the present season, designed to estimate the effect of the major elements, nitrogen potassium and phosphorous. The design eventually employed was of the factorial type; and duplicate experiments were laid out at both stations, in December, with the assistance of Mr. Jackson.

Laboratory work on the samples is now in progress and is being continued whenever an opportunity arises in the routine work of the laboratory. It is too early yet to draw any conclusions from the incomplete results although there is evidence of a distinctly smaller nitrogen content in the Chimvua soils, than in the Likuni.

Miscellaneous: The usual miscellaneous chemical work has been carried out since my return to Zomba, both for the Department and for planters.

Analyses have been made of:—

2 Samples of rice	5 Compost samples
2 Samples of fowl manure	3 Cotton Seed meal samples
2 Samples of water	1 Lime sample
24 Soil samples	3 Lime sulphur spray solutions

The Veterinary Department has been supplied with decinormal iodine for dip testing and three specimens from cattle suspected of dip poisoning, have been tested for arsenic.

With regard to the lime and lime-sulphur sprays it is of interest to note the difficulty to be expected in preparing lime-sulphur sprays or concentrates with local lime. The successful preparation of lime-sulphur concentrates necessitates a freshly and thoroughly burned lime and one with a very small magnesium content. Slaked or imperfectly burned lime, or one with a high magnesium content, is quite unsuitable. The advantages of using a commercial lime-sulphur concentrate of guaranteed strength, in preference to a home made one, of unknown and variable efficiency, thus appear very great.

Further work on the ethylene treatment of tobacco, mentioned in my 1937 report, could not be carried out during the year under review as I was at Lilongwe during the tobacco season.

In collaboration with the Officer-in-charge of the Zomba Experimental Station, experiments were carried out in the small scale production of starch and tapioca from cassava. As a result of this work it was concluded that such products could not easily be prepared of sufficient purity to find a commercial use on a small scale and with primitive apparatus. This work was fully reported at the time.

IAN ARMSTRONG BLACK,
Assistant Chemist.

Annual Report of Agricultural Officer, Ncheu.

General. The area covered by this report refers to seven administrative districts. The latter are represented by the whole of the South Nyasa, Ncheu, Dedza and Kota Kota districts, the Upper Shire district as situated to the west of the Shire River, the Massengela area of the Lilongwe district and the lake littoral together with the more easterly highland areas of the Dowa district.

The general agricultural activities as conducted throughout this wide area have been directed and supervised throughout the year by the Agricultural Officer, Ncheu, save during the period May-September when Mr. R. W. Kettlewell, as Agricultural Officer, Lilongwe, assumed responsibility for the Kota Kota-Dowa areas plus that small northern portion of the Dedza lake-shore which is bounded in the south by the Ngodzi River.

Staff. The agricultural organisation of the area is as represented below.

	Area of influence	European Staff	African subordinate Staff
A.	South Nyasa and portion of Upper Shire	One Agricultural Supervisor ...	8 Native Agricultural Instructors.
B.	Portions of Upper Shire and Dedza and whole of Ncheu	Two Agricultural Supervisors (*) ...	9 Native Agricultural Instructors.
C.	Dedza and portion of Lilongwe	One Agricultural Supervisor ...	5 Native Agricultural Instructors.
D.	Dowa and portion of Dedza	One Agricultural Supervisor ...	6 Native Agricultural Instructors.
E.	Kota Kota (and minor portion of Dowa).	One Agricultural Supervisor ...	6 Native Agricultural Instructors

The field staff as set out above is almost continuously " on ulendo " throughout the districts since it is its primary function is to maintain throughout the year the closest personal touch possible with the African cultivator in all phases of his agricultural enterprise and seasonal operations.

It aims to render to all members of the community helpful and practical advice and the large amount of instruction and propaganda carried out is supported by practical demonstration and/or illustration as frequently as circumstances permit.

The energies of the field staff are organised, directed, and supervised, by the Agricultural Officer who is responsible to the Director of Agriculture for its good organisation and the district work it carries out in general.

In their respective spheres of influence Aricultural Supervisors work in constant touch with the District Commissioners and keep them fully informed on all agricultural matters and work which is being carried out in their administrative districts. The Agricultural Officer in the course of his travels also makes suitable contacts with all Officers of the district administration.

The new method of marketing of the native trust land tobacco crop had its repercussion on the district agricultural staff, its work and organisation. A shortage of personnel for duty at receiving and buying stations occasioned the secondment of two Agricultural Supervisors to the Native Tobacco Board during the period April-July. This depletion of staff no matter how necessary were the reasons creating it provided an unfortumate break in the continuity of

N. B. (*) This includes one extra Agricultural Supervisor who is primarily a convenience to the organisation of the Native Tobacco Board. He is employed on a " fifty-fifty " arrangement basis between the Department and the Board. The headquarters for the small area in which he operates is Ntakataka. On the purely agricultural side of his duties (i.e. non-tobacco) he functions as assistant to the Agricultural Supervisor, Ncheu, whose wide area embraces the new small tobacco growing extension area the existence of which with potentiality for a native tobacco growing industry had actuated the Board in their decision to post him to the centre mentioned.

agricultural thought and influence during a not unimportant season. It left a native subordinate staff without the constant supervision it requires and it threw an added burden of extra duty upon the Agricultural Officer. It seems that should this expedient require to be a yearly feature of future tobacco marketing seasons then work of an experimental or demonstrational nature must suffer accordingly through their being denied that supervision which is so much a first essential to the success of such activities. In fact could it be stated that certain Agricultural Supervisors would be withdrawn annually to assist at tobacco markets then it might be argued in reason that no experimental or demonstrational work should be put in hand in those areas in which their normal duties are performed.

Weather Conditions. Whilst to the north of Ncheu the break of the rains was late precipitations were normally early, if somewhat heavy, on the areas Ncheu and southwards.

(*January*). Rains were excessive throughout Ncheu and Dedza districts. In the Upper Shire and South Nyasa districts the month was conspicuous for its marked absence of sunshine although the rainfall was not unduly high.

The rainfall in the Dowa highland and lowland areas was more or less normal.

In the Kota Kota highlands an abnormally high rainfall was recorded with an unusually low figure in its lake-shore area and particularly so to the south of the Bua River.

(*February*). Almost without exception all areas experienced a drought period of approximately three weeks in duration.

(*March*). Excessive rains in certain of the southern areas contrasted to dry conditions which were a feature of the southern littoral of the Kota Kota district.

(*April*). Rain was fairly general throughout the first half of the month save in the case of the Kota Kota district which recorded an unusually high precipitation figure.

Conditions were more or less normal in other areas.

The season in general can be best described as a variable one but on the whole fair.

Maize in parts of the Ncheu and Dedza highlands suffered through excess of rain in January and the later sown crop through drought in February.

In the Kota Kota district a large acreage of paddy was only just saved by heavy late March and April rains which in similar manner greatly improved the food crop situation in general.

Native Food Crops. At the outset of the season there was such visible evidence of a healthy and generous acreage under maize that there was promise of an abundant crop to come. As it happened this promise was not fulfilled and maize yields in general were certainly under average.

There were only a few isolated instances where a surplus was harvested and it was fortunate that the shortage which occurred in several areas at the lower elevations did not assume unduly serious proportions.

Yields from millet crops of kaffir corn and finger millet were generally fair throughout.

Groundnuts did particularly well in all areas. The crop was conspicuously free of rosette disease.

Beans did quite moderately well in general. Both crops produced a surplus to the needs of the people and whilst the former found a ready sale on the markets established for their disposal in the Dedza/Lilongwe areas the latter in smaller quantity also found a cash market in the Dedza/Ncheu areas.

Root crops of cassava and sweet potatoes yielded in a satisfactorily normal manner. Both of these crops could have their acreage extended with advantage in many areas since they provide what is little short of a secure food insurance in times when the maize crop proves short. The cold season cropping of sweet potatoes as a catch-crop in paddy lands is a practice which provides an ideal sequence of cropping and could be most usefully developed.

Under this important paragraph head ("Native Food Crops") an urgent need for a more abundant production of food crops to meet the needs of the people within the Makanjila area of South Nyasa had become a matter of such vital importance that it was decided active measures would require to be taken if any material improvement of the position was to be obtained.

Government directed that the matter should receive immediate and special attention and an Agricultural Supervisor was posted to Fort Maquire to work throughout a season of agricultural operations in what had come to be known as the "Makanjila Distressed Area".

Mr. C. W. Coombe was selected for the appointment and his entire energies were applied solely to this special work for the six month period of October to March inclusive in an endeavour to attempt some betterment of the most unsatisfactory situation which an accummulation of adverse factors had crystallized themselves into.

Attention was paid to extension of garden acreages, thorough preliminary cultivation of gardens, increase of acreage under cassava and pigeon pea, more efficient and adequate cultivation of the growing crop and the protection of gardens against marauding fauna.

Backed by the whole-hearted support of the District Commissioner it was possible to see that some regard was being paid to the advice and instruction which was being given to those concerned and if the results so obtained are not highly spectacular it is nevertheless satisfactory to be in a position to record that the food situation has been so materially improved as to contrast more than favourably with its former parlous state.

The area is marked out for a continuance of concentrated attention being given to it and with the promise of such interested, able, and forceful administrative support being again available there can be no doubt that a further improvement of the position is almost bound to be accomplished.

In the 1938-39 season advantage of a falling lake level is being taken to stimulate interest in an increase of acreage under paddy and in similar *madimba* extensive winter cropping of sweet potatoes (and maize wherever possible) will be rigorously encouraged.

Groundnuts: An effort to foster interest in a native groundnut growing industry was bolstered up by making available additional seed stocks to potential growers. This arrangement had been decided upon to meet (*a*) a general shortage of seed stocks and (*b*) expressions of opinion made by others to the effect that yields from local seed stocks were poor and that bunch exotics were required to build up the unit acre value of production.

With the exception of a very small proportion the seed which was made available was of the bunch type. The bulk of it had to be obtained from outside of the Protectorate and at a final cost to Government amounting to 3d. per lb. (in shell). This seed was sold to the Native at 3 pounds for one penny (in shell).

The seed was disposed of by sale as follows :—

District	No. of sales	lbs.
Ncheu	60	1,206
Dedza	2,172	42,867
Lilongwe/Dowa	406	7,723(*)
Kota Kota	1,075	19,308
Total	3,693	71,104

Ninety per cent of these sales represent bunch seed stocks.

A detailed census of growers and cultivations was carried out in the Dedza highlands and in a small adjacent section of the Lilongwe district.

This census which covered both bunch and sprawling types formed the basis of the following estimated figures of acreage and production :—

Acre	No. of growers	Estimate of acres	Estimate of Crop. Tons (*2)	Estimate of surplus crop for sale. Tons (*3)
Dedza (*4)	5,514	3,550	1,725	1,100

It is of interest to note that of these growers no less than 1,253 were women.

Additional to this census figures taken in the Kota Kota district and throughout the Dowa lake littoral and the adjacent area under N. A. Ndindi (Dedza lake-shore) suggested further surplus estimated tonnages for disposal as under :—

Kota Kota district	250 tons
Dowa district and adjacent area	170 tons

The crops grew well and there was a marked absence of rosette disease in all areas. An improvement on the growing side of the crop was observed in respect of the closer spacings rate adopted by a number of growers in response to instruction given in this connection.

A large proportion of the acreage was planted up however in mixed cultivation with maize and this latter factor rendered more difficult the assessment of production estimates.

(*) included in this total are the only native seed stocks sold. The latter amounted to 6,663 lbs. (342 sales) to Dowa natives. Bunch nuts (in shell) amounted therefore to 64,441 lbs.

2=in shell. 3=kernels as estimated to be the surplus available for sale after a provisional allowance of 150 lbs. to meet the needs of each grower for (1) food and (2) seed stocks had been taken into account. *4=inclusive of 179 growers in the Chimbulanga area of the Lilongwe district.

It having been decided that an organised system of markets would operate in the Dedza highland areas every care was given to placing these at best advantage in respect of density of production, accessibility in regard to transport and with a view to ensuring that the distance to carry for the producer placed no undue hardship upon him. From the standpoint of suitably meeting these three important marketing considerations it can be accepted that the very best interests of all concerned were admirably met by the establishment of buying centres at Kachere, Tete, Mayani, Linthipi Bridge and Mkhoma.

Markets opened on the 2nd of August with four buyers in the field and with every evidence of keenest competition. Opening prices were commendably high at 14/32d. for two pounds of kernels but even so commendable a price did not appeal too strongly to the grower. So much so did this prove to be the case that the marketing season dragged on in a lamentably sluggish and desultory manner with the result that competition weakened and the price lengthened somewhat as a consequence.

Markets closed on November 19th having run for no less than three and a half months. During this period something like 6,000 parcels were handled which figure represents an approximate average sale per grower at somewhere in the neighbourhood of 1 cwt.

The grower was encouraged to sell in shell in order to save him the hardship of shelling but the small number of sales of nuts in shell which were effected proved that this alternative made a comparatively small appeal to growers as a whole.

The total sales as returned by Principals are :—

Dedza district	...	(all markets)	...	235.3 tons
Lilongwe district	...	(Mkhoma)	...	80.2 tons
Total	...		...	315.5 tons

The average prices paid throughout the buying season were one penny for $2\frac{1}{8}$ lbs. of kernels and one penny for $3\frac{1}{2}$ lbs. of nuts in shell.

The total sales value to the Native of the Dedza/Lilongwe highlands crop was approximately £1,397.

Sales of nuts in the Kota Kota district conducted at an average approximate price of ½d. for one pound amounted to 35 tons or a total value of £163 approximate.

Dowa district sales reached 55 tons of nuts and these again fetched an average price of ½d per one pound or the equivalent of £255 approximate for the crop marketed.

The large discrepancy between the figures of estimated surplus of crop as calculated would be available for sale and the actual market tonnage returns from the controlled marketing area of the Dedza/Lilongwe highlands calls for some explanation. It could be argued in reason that the estimate itself was seriously at fault but since the greatest possible care was taken to arrive at the figure quoted (1,100 tons) it seems that so large an error of judgment could not have taken place. Suggested heads under which in all probability certain errors did creep in however are given below :—

(*a*) an over estimate of acreage
(*b*) an over assessment of the unit acre of production
(*c*) an under estimate of the amounts which growers would reserve to themselves for food and future seed stocks.

It is to be noted that the average garden acreage figure was not found to be unduly high at .6 acres and particularly is this so when full consideration is given to the fact that production had been fostered and conducted on a cash crop basis and not merely as a normal source of *ndiwo*. The yield per acre was assessed in moderate terms at a half ton in shell and loss in shelling was put at 25 per cent. It is of interest also to note that the average acreage per grower at .65 acres does not appear to have been over inflated. It should be noted also that a 10 per cent increase on the original estimate of production in order to cover a possible infiltration of nuts from outside neighbouring areas was allowed for.

In face of the foregoing and making due allowance for a reasonable margin of error under (*a*), (*b*) and (*c*) above it is contended that the short-fall on estimate is attributable mainly to other forces less simple to control. It is believed that the attitude of the grower himself was a potent

factor contributing to the adverse sales figures in relation to market expectations. Amongst the reasons advanced in support of this latter impression are ;—

(*a*) the price factor. The strongest expressions of dissatisfaction with prices offered were more or loss general. Unfortunate and illogical as it may appear many natives are prone to think of tobacco prices as a standard and to compare the price per pound of other commodities to the price paid per pound for tobacco. Others argue that the small sales of a modest pound or so as conducted between native and native and which fetch anything up to one penny per pound provide the standard of price he expects to obtain when disposing of his entire surplus crop.

(*b*) sales between native and native.

(*c*) oil expression ; a greater home consumption of nuts and oil.

(*d*) the holding over of heavy stocks for later disposal in a variety of ways.

It is to be hoped that next season may find the grower with a more reasonable and balanced conception on the score of what represents an economic price offer for his nuts. Dissatisfaction still exists and on that account and for the future it is proposed to go no further on the question of estimates than to give the number of growers together with the estimate of acreage and probable total production since it is not humanly possible to calculate what under varying sets of circumstances the grower will do with a crop that has both cash and food values.

Cotton and tobacco he has to sell in the markets provided for him but food crops are an entirely different matter and as has been borne out equally in the estimating of the Kota Kota rice crop.

In the Kota Kota and Dowa districts it is thought that the short-fall of sales as recorded in their relationship to production estimates is attributable to (*a*) the price factor and (*b*) the non-provision of controlled markets and a consequent spasmodic and unchecked disposal of nuts to various traders located throughout a wide area in village native trade stores.

It seems that it is only at peak prices on the European market that a price can be paid which will make reasonable appeal to our growers and at the same time satisfy the buyer as to the profit he requires to make.

The Rhodesian and S. African markets would appear to offer us best possibilies in the meantime. These latter markets require that nuts shall be available early in the year and in order that manufacturers can purchase according to monthly requirements. In these circumstances an earlier buying season would be required to meet this particular trade. In last season orders for these African markets which might have been filled here went to the Congo owing to the later date on which our markets had opened. One local buyer has received enquiries already for some 10,000 bags for next season but to secure all of this order early delivery would be a first essential.

Wheat :—A successful crop with a low incidence of rust is recorded.

The census under this returned 429 growers with gardens averaging in the neighbourhood of .10 acres per individual grower.

Revealed sales todate are :—

Dedza area	... ...	54,817 lbs.
Lilongwe (Mkhoma)	...	1,000 lbs.
Total	...	55,817 lbs.

Prices paid averaged 1d. per pound or a total crop value of £232 10s. 0d.

An increase in acreage is anticipated in 1939 in both the Dedza and Ncheu highland areas.

European Potatoes :—This crop is a singularly awkward one to obtain a line on what is the annual production made since there exists no defined planting season.

The latter ranges throughout the year on sites selected to meet the particular season of the year for the planting of each successive crop.

It was possible to trace the undernoted sales but these must represent only a small proportion of the crop produced since large quantities find unrecorded sales conducted on the railway track and on the main road-sides to passing lorries and cars.

The average selling price is ½d per one pound.

Dedza area	... ...	23,600 lbs.
Lilongwe (Mkhoma)	...	300 lbs.
Total	...	23,900 lbs.

Beans :—A good crop was returned from the Kasumbu area (Dedza) and some 8 tons were returned as sold. Other sales took place but no returns of these have been received.

Maize :—The effort put forth in the lowlands of the Ncheu district and adjacent areas with a view to the creation of a flat white maize growing industry and the ultimate establishment of an export trade was rendered abortive owing to an insecure food situation in other parts of the Protectorate.

It was estimated that a potential 100-150 tons were produced for market by 590 growers. The Maize so grown was valued on sample to be the equivalent of Kenya K.2. grade and would have been readily marketable at the then ruling price of 26/- a qr. This would mean a possible 7 lbs. for one penny *f.o.r.* as being the price payable to the grower.

As seed maize it was undesirable however for future F.W.M. production requirements since it contained one per cent of yellow grain.

As a passing expression of opinion it is considered unlikely that any real degree of enthusiasm would result as the low price offering would undoubtedly prove a limiting factor in native eyes to really heavy production.

Rice :—The purchase and installation of a rice milling plant to handle paddy produced in the Kota Kota district presents an advance of some moment.

The plant is a No. 2 " Planters Mill " made by Lewis Grant, Dysart, Scotland. The mill and rotary-sieve grader are driven by a 15 H.P. semi-diesel Petter engine. Capacity of the mill is 2.5 tons of white rice per 10 hour day. The approximate all-in cost of installation was £240.

An additional innovation was the formation of the Kota-Kota Rice Society. This body or committee works under the direction and guidance of the District Commissioner. It receives agricultural advice from the Agricultural Officer or his representative in the person of the Agricultural Supervisor. Serving on this committee are influential representatives from the sections of each Native Authority located within the paddy growing area. Its function is to deliberate and to decide upon all rice matters and expenditure and in this connection it has played an extremely useful part in creating a greater degree of understanding and increased satisfaction amongst the paddy growing community.

On the growing side of this dual purpose crop (*i.e.* cash and food) the attention of the grower was again directed to the sowing of pure seedings of any variety which found greatest favour with him and in particular to an increase in acreage under *faya* in pure stand to provide him with cash from a readily marketable crop.

Amongst the local Nyasaland varieties this latter paddy is undoubtedly of outstanding merit and provides us with a good white rice for which there is an increasing demand. Until a better variety is found it would appear to remain sound policy to encourage the variety upon which our recent market has been founded and to endeavour by such means as mass selection in the field to aim at maintaining what are best in agricultural characteristics of faya and to maintain if not actually to increase its yield capacity.

The season was less favourable to the crop than it might have been but the serious consequences of a dry February were compensated for in part at least by the much more favourable conditions which maintained during the month of March.

A detailed and careful survey of the crop was made during January, a census of growers and gardens taken and acreage estimated. With these requisite data available a careful and conservative estimate of the crop was framed. It was unknown what proportion of the crop the grower would retain to himself for food and future seed requirements nor as it will be realized can this be assessed in a reasonably reliable a manner since many factors *e.g.* an abundance of food or otherwise, ephemeral but more attractive markets etc., etc., may develop to materially affect the attitude of the producer towards what he is willing to dispose of on the main established paddy markets.

Once the time has come when such food crops as rice and groundnuts are more thoroughly established in the minds of the people as agricultural industries and the native becomes accustomed to grow a given acreage annually for cash as distinct from an acreage to meet his own personal wants then it will be a simpler matter to arrive at something like an accurate estimate of what tonnage may be expected to find its way on to markets established to deal with such food crop commodities. It must be accepted that both of these industries are as yet in their infancy and that it will take some time before such enterprises settle down to the more or less set state of affairs which apply to the tobacco and cotton crops.

In the circumstances as set out above it would appear as having been quite unavoidable, although very unfortunate, that the estimate of 339 tons did not materialise and that the short-fall amounted to as much as 112 tons.

Crop estimates and market and milling figures for the rice crop appear below.

TABLE 1.

CROP ESTIMATES.

No. of growers	Acres approx	Av. acres per grower	% faya	Av. yield per acre *	% retained by grower	Total tons *	Tons for market *
3,455	1,741	.47	80	700	37	537	339

(* =hulled rice)

TABLE 2.

MARKET AND MILLING FIGURES.

Paddy purchased and handled by mill lbs.	Clean rice purchased lbs.	Price paid for 96 lbs. paddy	Price paid for 60 lbs. clean rice	Total cash paid to grower	Value of crop sold £	s.	d.	Av. sale price 60 lbs. cleaned rice at Kota Kota	Working days mill No.	Av. output mill per days Tons	Proportion grade 2 to grade 1 approx.	Loss on milling %
575,978	141,531	3s.	3s.	£1,259	1,530	11	10	3s. 7d.	80	$2\frac{1}{3}$	1/6th	34.6

Cotton: The year saw the advent of the auction system and to it must be ascribed the creditably high prices which were enabled thereby to be paid locally. The crop was keenly competed for and bids were made on a basis of September futures at 4.52d. Weekly market rises and falls were taken into full account and for every 12 points of fall or rise in the market so was the price paid to the grower raised or lowered by 1/32d. accordingly.

As a result of this system markets became the sole property of the highest bidder. There were no longer several concerns competing against each other in every market and as a direct consequence the buyer had at his disposal every opportunity to inspect his cotton for grade as it was offered to him. In this manner complaints on the score of grading could not arise since the buying agent was in no way distracted as was formerly the case. Under the head grading the position was thrown therefore into its correct perspective by placing the complete onus of responsibility on the buying agent for what he accepted in terms of grade quality.

Viewed from the standpoint of the grower the system includes one or two unpopular features none of which it would seem could not be cleared up in a satisfactory a manner.

The main dislikes are:—

(*a*) he cannot see visible signs of competition going on.

(*b*) on opening, and rush, days sellers are held up, even over night, due not only to a smaller number of buying agents available for handling parcels but on occasions on account of the additional time taken up by inspection (a feature almost conspicuous by its absence in the "free-for-all" market days).

(*c*) removal of any useful purpose being served through such time honoured practices as the giving out of advances or offers of such other attractions as might be taken to fall within the category of an "inducement."

(*d*) an inability to dispose of grade No. 3 for grade No. 2 prices; a not unusual practice at past markets when competition was keen and the buying agent with his commission at stake was excercised to obtain the biggest tonnage possible.

From the standpoint of the ginnery-owner buyer were it possible for transport rates to ginneries to be zoned then it would be both advantageous to him and to the industry situated within the ginnery buying area.

Agriculturally the simplicity of the system has everything to recommend it and particularly so since much more time is available to the agricultural staff for other important field operations. The old system appeared unnecessarily wasteful of personnel who instead of being locked up on markets for weeks on end can now be engaged elsewhere to greater profit on other work. Given that for the future certain modifications are incorporated into the system then it would appear to offer quite the best method for the marketing of cotton which hitherto has been tried out within the Protectorate.

Seed was distributed from a total of 19 depots. With the exception of the Dowa/Kota Kota areas where slight increases were realized the amount of seed issued in the remainder of the area was down by 34 per cent (approx.).

The total decrease in growers throughout the area was 7,025. There was a small, and unexpected increase of 388 growers, however, in the Kota Kota district.

The season was a good one and for the most part the crop was well grown according to native standards. The degree of uniformity in early planting which is to be desired showed an improvement although more could be achieved under this head to the benefit of the crop itself as well as in the direction of ensuring that the marketing period is not unduly drawn out as well as to obviate requests that later marketing facilities (2nd markets) be provided. These 2nd markets are usually a disappointment and save under rare and exceptional conditions of season should not be necessary were uniformity in early planting more generously adopted by all growers.

Red boll worm levied its toll on the crop as usual. Random counts taken on a generous scale throughout a large series of gardens spread over a wide and comprehensive area suggested that the damage due to this insect might be placed somewhere in the neighbourhood of 28 per cent There was a widish range of variation between certain areas *e.g.* the figure for the Banda area (Ncheu) was as high as 50 per cent whilst that of the Kalembo area (Upper Shire) was only 17 per cent.

Cotton stainer bug incidence was unusually light and its migration from the bush into the cotton cultivations appeared to take place at a somewhat later period of the season than is usual.

The crop broke well and returned a commendably high proportion of clean (grade No. 1) raw cotton. The total crop amounted to 1,647.5 tons approx. or a shortfall of 182.3 tons on the 1937 crop.

The production factor per pound of seed issued was 6.29 and represents a marked improvement over that obtained in 1937 at 5.48.

The estimated average yield per acre was 330 lbs. and this compares with the estimate of 214 lbs. per acre obtained in 1937.

For the forthcoming season a further serious decrease in the number of growers, and acreage is anticipated. The factors suspected of influencing this continued fall off in interest are low prices, emigration and a counter attraction in the extension of tobacco growing which is being actively encouraged in the Bwanje Valley and other adjacent areas.

There is little doubt that as a whole the Native in these areas has not yet developed a cotton consciousness as have the natives in the old established cotton growing areas of the Lower River.

It is feared that following upon the good prices which were maintained during the opening phases of major development of the crop such a spectacular recovery could not be made in these areas since the impression is obtained that the native does look to an average price of 1d per one pound or over in order to maintain his interest. Future progress of the industry would seem to hinge therefore upon (*a*) improved prices (*b*) improved acre yields in lieu thereof or (*c*) by the raising of the acre value of cotton by providing a strain which in addition to a high yield capacity has the added merit of a higher lint value. Otherwise there is every indication that the movement will be backwards and not forward.

That our existing U/4 mixed bulk seed stocks are capable of high yields is endorsed by the yields obtained on experiment stations but the fact remains that the industry is a native one and we have to consider the average acre yield obtained under native methods of production. A suitable parallel is perhaps found in the case of maize; the European farmer requires and probably obtains on the average a much superior yield per acre than does the average African yet the latter obtains what appears to meet his requirements and doubtless in relationship to the amount of energy he is willing, or capable, of applying to his work on the crop in the field. The point which it is endeavoured to make is that in so many respects we must be guided by African standards and not European.

In the cotton areas where as mentioned above tobacco provides a competitive cash crop it may be taken that on a basis of 1938 market values tobacco has an acre earning capacity quite three times as big as that for cotton.

Figures taken from two accurately measured gardens (one under each of the crops concerned situated *side by side* and from each of which the exact sales slips were obtained gave the actual value of the tobacco crop at 3.8 times greater than that obtained from the same acreage under cotton. Alternatively expressed .25 acres tobacco were nearly the equal to 1 acre cotton in terms of cash.

Land Control, Utilisation and Development:

Water Supplies: Well and bore-hole sinking operations have continued. These essential to the domestic requirements of more or less permanent settlement fall into two main categories. (*a*) Improved water supplies in already established villages and (*b*) the provision of an adequate water supply in areas that have agricultural potentiality but where the population has been limited by lack of an adequate water supply.

Except where special considerations apply development under this head has been confined to the Lake Shore or similar areas that are suitable for the development of so called "economic" crops.

The programme includes:—

South Nyasa:

(*a*)	*South West arm*:	18 sites completed
(*b*)	*East Malombe*:	22 sites selected
	Dedza:	14 sites selected
	Dowa:	10 sites selected
	Kota Kota:	4 sites selected

With emigration as much to the fore-front as it is today there is excuse for speculation as to how this may re-act upon the speed with which settlement of new areas takes place since the young, strong and virile male must be assumed as a potent factor on the side of development.

Soil Conservation: Work under this head has made creditable advances. Main focal points of influence are (*a*) the Nchisi escarpment area of the Kota Kota district and (*b*) the central hill area regions of the Ncheu district and with particular regard to the headwater areas of the Livulezi River and its tributaries and to the higher portion of the Msipe River valley.

In the Nchisi escarpment area some 355 acres of cultivations have had contour bunds laid out in them whilst in the Ncheu area under influence some 210 acres have been similarly treated. In an attempt to more clearly indicate the alignment of the bunds (laid out by use of the road tracer), as well as to assist in the holding of them, these have been planted to pigeon pea and which since it will be allowed to perennate as ratoons will enable the cultivator to work them up more accurately in the forthcoming dry season.

A seven acre demonstration of contour bunding (or contour draining) has been established in the Dedza highlands at Mkutu village near to the source of the Nankhokwe in the section of N.A. Kachindamoto. It is proposed to extend the work further from this point in 1939.

In the Kota Kota district work is now being extended to the country of N.A. Ntondo.

Apart from the progress mentioned above a big advance has been made by successfully persuading a large number of cultivators to change over from "matutu" cultivation as commonly favoured and practised to ridge cultivation on the contour. It is surprising how well some of this has been carried out with no other aid than the eye as a guide.

As a necessary adjunct to this change in type of cultivation to another line planting is being encouraged and in many instances with considerable benefit to a better balance of acre plant populations. In the Ncheu district somewhere in the neighbourhood of 1,900 acres have been contour ridge planted without the aid of any levelling device and in the Dedza district it is estimated that some 2,500 acres have been ridge planted where formerly "matutu" cultivation took place.

The sympathetic attitude of N.A. Gomani has contributed greatly to the progress which has been achieved in the Ncheu district. The large number of stock and the problem of grazing them presents a difficulty which has still to be overcome in this district.

A land utilisation policy for the heavily populated and steep sloping hill country in the neighbourhood of Nchisi was evolved after close discussion of the position with the District Commissioner, Kota Kota, the Assistant Conservator of Forests and the Agricultural Supervisor,

Kota Kota. The Agricultural Officer and the Forest Officer carried out an examination of the area and also put into practice those measures it had been decided would require to be enforced to meet the situation.

The steps to be taken were:—

(*a*) closure of the principal hills and slopes which play a critical part in the conservation of water-supply

(*b*) the prohibition of agriculture on slopes liable to lose an excessive amount of soil under native methods of cultivation

(*c*) the utilisation of areas closed under (*b*) above for either (1) village forest areas or (2) forest reserves

(*d*) the improvement of agricultural methods by (1) the adoption of planting ridges (2) the extension of useful cover-crops such as groundnuts and (3) the gradual introduction of properly laid out contour bunds

(*e*) early grass burning.

It was agreed at the meeting that if the above restrictions did occasion a small amout of local emigration then the area would benefit thereby rather than otherwise since the pressure on the land was already heavier than is desirable.

Extension Work: The Bwanje Valley Rural Development Scheme: Special attention to work on the four chosen well settlement villages of Nadimba, Kaiya, Agubu and Nkhwani has continued. These four villages have a total population of 36 huts and are so placed that the demonstration plot established at Sharpe Vale in 1937 is conveniently central and accessible to them.

Meetings are held at the plot for talks and demonstration purposes. For a long period Nkhwani proved to be difficult and on that account was left out of the programme. Recently however when spurred on doubtless by the example set by his neighbours he has commenced to show some interest.

The native Agricultural Instructor in charge of the plot makes regular contact with the villagers in their garden areas in order to help them by the proffering of useful practical advice.

The plot is run on a simple two course rotation of cropping plan and sets forth in demonstration what it is aimed to influence the villagers concerned to emulate. Line planting, correct spacing, seed selection, the better storage of grain and compost manufacture and its use are amongst the various agricultural measures which are demonstrated.

A variety of fruit trees including papaya, lemon, grape-fruit, date palms and cashew have been planted up, and pine-apple plants have also been established, on the plot itself.

In the villages progress has been made with line planting and now that a block layout of gardens has been attempted the next step will be the change over of gardens to the 2nd year of the 2-course rotation.

In addition all four villages have benefited by the spot sowings of cashew and papaya (selected) which have been carried out, the free distribution of seedling trees of grape-fruit and lemon and by arrangements which have been made to establish small plots of pine-apple plants for each hut.

Progress is of necessity slow but undoubtedly the movement forward is in evidence.

Fruit: Concentrated effort to increase the establishment of fruit trees throughout village areas in all districts is receiving serious attention. Seedling plants have been raised for this special purpose and the following is a record of their distribution:—

District	Rough lemon	Grape fruit	Peach
S. Nyasa	375 (*)	85	150
Ncheu	450	75	200
Dedza	205	—	100
Total	1,030	160	450

*It is of interest to record that with a growing taste for tea the juice of lemon is now being used in place of milk which latter commodity is so rarely, if ever, available in many areas.

In S. Nyasa special encouragement is being given to the extension of banana growing and efforts are now being directed to the better management, health, sanitation and general care of banana groves.

District Demonstration Plots: Following upon close discussion with District Commissioners and Native Authorities concerned it was decided to establish plots at the following centres of influence:—

South Nyasa:	1.	N. A. Jalasi.
	2.	N. A. Mponda.
	3.	N. A. Makanjila (Chilinda).
Upper Shire:	4.	N. A. Kalembo
Ncheu:	5.	Sharpe Vale*
Dedza:	6.	N. A. Kaphuka.
Dowa:	7.	N. A. Karonga (Salima)
	8.	Dowa Boma†
Kota Kota:	9.	N. A. Mwadzama (Benga).
	10.	N. A. Kasakula.

All plots are laid out to a definite cropping plan based on simple 2-course rotations such as combined with the utilisation of compost and the use of soil restoration cropping under pigeon pea fallow is calculated not only to lengthen the lasting period of useful fertility but to offer to the native something which is simple and in part founded upon his own agricultural practices.

Already there is evidence that these plots are awakening interest and are providing useful centres at which to give practical demonstration of what is daily being advanced to the agricultural communities throughout all district areas.

The running costs of the South Nyasa plots (Nos. 1-3) and the Upper Shire plot (No. 4) are met by funds provided by the Native Treasuries and for the season 1939-40 it is hoped that all the plots will be financed in this manner.

It is proposed that if funds are made available the following additional plots will be opened in 1939:—

Dedza:	1.	N. A. Tambala (Chitundu)
	2.	N. A. Kachere (Maonde)
	3.	N. A. Kasumbu (Kasumbu).
	4.	N. A. Kachere (?).
Lilongwe:	5.	N. A. Massengela (?)
Dowa:	6.	N. A. Chiwere (Khombedza).
	7.	N. A. Chiwere (?).

Jeanes Community Workers: The first batch of trainees from The Jeanes School were released during the year. Unfortunately the termination of their course took place at so late a date as to leave them too short a space of time in which to select, open up and prepare holdings as well as to build houses in which to live before the break of the planting rains was imminent. It is recommended for the future therefore that the course be completed rather earlier in the year.

Agricultural Supervisors have made contact with all Workers and whilst as yet it is too early to offer criticism of the benefits it is hoped that the latter will reflect on the communities amongst which they operate it would be ungenerous not to make special mention of the high standard of agricultural attainment and the excellent example which has been set by the Worker at Chinsamba Mlopa in South Nyasa. It is so encouraging an effort as to bode well for the good which may be expected to crystallise gradually out of this movement.

Experimental Work: The small scale on which work of this nature is carried out in the district hinges entirely upon problems which from time to time confront the Agricultural Officer in the course of his work in the field. As correct and early an answer as is possible is required to meet difficulties as these occur and to obtain solutions to them properly designed and conducted trial plots are put in hand to provide the information which is wanted for early application to the work of the Agricultural community amongst whom he operates.

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*Bwanje Valley Rural Development Scheme—established 1937.

†This plot is the Prison Garden but it is so conveniently centred as to provide an ideal soil conservation and correct method of planting demonstration. The garden was accurately contour bunded in 1936.

The following trials are in hand at present:—

(*a*) *Miscellaneous Crop Trials*—Conducted at Mpinganjila, South Nyasa. The object being to observe the behaviour of new crops and to bulk up for later issue to natives such as show major promise. Short-age sorghums, drought resistant maizes and buck wheat feature mainly in these trials.

(*b*) *Groundnut Variety and Method of Planting Trial*; At "Akudamera", Dedza. The trial aims to test the relative yield values of the bunch and sprawling type of nuts under the flat and the ridge methods of planting and cultivation.

(*c*) *Paddy Variety and Method of Planting Trial*: At Kota Kota. The yield values of the North Nyasa varieties *faya* and *msafili* and the Kota Kota varieties *njojo* and *mwanamgeni* are being examined under the broadcast and the native "in situ" methods of planting and cultivation.

(*d*) *Paddy Varieties from Burma*: To observe the behaviour, and to test the yield value, of a range of non-glutinous rices specially imported for trial under Kota Kota paddy growing conditions of soil, climate etc.

(*e*) *Cassava Varieties*: The Agricultural Officer, Mlanje, has in hand the systematic examination of a full collection of Nyasaland varieties in order to ascertain their distribution, variation in nomenclature and of greatest importance the position in regard to the incidence of mosaic.

A collection of propagation material, together with various data covering 25 named varieties, have been provided from the districts in this area. The same variety in instances may have a different name according to district and this investigation will clear up any confusion which could arise on that account.

PLANT PESTS:

Locusts: A recrudescence of the red-winged species took place in the most southern districts of the area towards the latter part of December.

OBSERVATIONS AND REMARKS:

Nutrition: Efforts are constantly directed to increase the acreage under, and the consumption of, food crops with a high protein value. The greater acreage under groundnuts during this year has doubtless resulted in a more general consumption of that crop than is usual.

Seed Stocks: It was unfortunate that having prepared the ground in collaboration with the District Commissioners concerned for an extension of acreage under groundnuts in the districts of South Nyasa and Ncheu seed of bunch nuts were unobtainable on account of the reluctance of Dedza natives to sell stocks at 3 lbs. for one penny in shell. Twenty-five tons had been required and only a paltry few hundred pounds could be purchsed.

Native Sub-ordinate Staff: There is little doubt that extension work could be greatly accelerated by the provision of a more suitably educated class of agricultural instructor. At present the general standard is below what is required but it is all that can be expected since the pay, terms of service, and prospects are not altogether attractive to the better educated classes.

This handicap has to be overcome and the only means of so doing is the provision of that long overdue central training institute where under a European competent to teach both the theory and practice of agriculture to Africans a full course of study could be undertaken. Pay rates and service conditions would require to be made attractive and could this be brought about then it is believed that a suitable type would be obtainable. It would be an essential of the training period to impart an understanding of the fact that collar and tie is not a first essential to dignity nor is a certain amount of necessary manual labour degrading to the prestige of an intellectual.

Native Agricultural Shows: The Ncheu district held its first show. It was organised entirely by the people themselves and was staged in a remarkably fine and commodious show ground at the central point of Mbemvu. Show stands were admirably set out and the space provided for exhibits left nothing to be desired. There were on exhibition a commendable variety and range of produce in most classes and the very generous list of cash prizes which had been donated were well competed for. Every credit possible is due to N. A. Gomani as well as to his "alumuzana" for the extremely creditable exhibition their energy, their thought and care, provided.

The show which was opened by the Hon. The Chief Secretary, was well patronised by a large number of mission Institutions and Government officials.

FRANK BARKER,
Agricultural Officer.

Report of the Agricultural Officer, Blantyre.

General:—This report deals with the administrative districts of Blantyre and Central Shire (Neno), Cholo, Chikwawa and Lower Shire. During 1938 this area was in charge of the writer, stationed in Blantyre, and assisted by three Agricultural Supervisors, Messrs. G. C. Dow, G. D. Hayes and E. E. Carrall Wilcocks, stationed respectively at Blantyre, Chikwawa and Port Herald. All three were granted six months' leave in England in 1938, Mr. Hayes being away from February to July and Messrs. Dow and Carrall Wilcocks from June to December. The writer would like to record his appreciation of their conscientious work during the past year, work which has been ably supported by the various District Commissioners with whom they come in contact and to whom thanks are also due. Ready assistance and co-operation have also been given by members of other Departments and of the Empire Cotton Growing Corporation and by principals and agents of the various cotton buying firms; to them all the writer tenders his thanks.

Meteorological. The outstanding features of the 1938 weather were very heavy rains in January, following normal rainfall during November and December, succeeded by a drought in February and by exceptionally heavy rains in March. In total amount the records show nothing exceptionally high compared with other years but the unusual distribution played havoc with the maize and tobacco crops in the highlands.

On the Lower River as a result of heavy January rains the maize and millet gardens were rapidly overgrown with weeds and the crops received a serious setback from which many never fully recovered. The drought in February was more severe south of Chiromo but even in the north it lasted for three weeks. Millets suffered less than maize.

The level of the Shire River was still high at the close of the 1937 season and rose in flood again very soon after the rains broke up country. Early in January the greater part of the low-lying maize land was inundated and by the end of the month the crop was yellow and dying. River levels continued high throughout the year and although they began to drop slightly in March the dimba lands throughout the season were mostly under water, or so waterlogged that no crops could grow. River steamers were able to run right up to Chikwawa but had some difficulty in passing under the Chiromo railway bridge.

1. Native Food Crops.

General. Throughout the whole of the area under review, on the Lower River plain and in the Shire Highlands alike, the 1938 harvest was exceptionally poor. Long before the end of the year natives everywhere were augmenting their scanty grain supplies with sweet potatoes, cassava and beans and in many villages all grain had been eaten by the end of November.

Pulses yielded well and in most districts there was a surplus with unfortunately practically no market. Groundnuts also gave a heavy crop and remained free from rosette disease.

The sweet potato acreage was appreciably increased and a good crop relieved the food situation considerably.

In the Highlands the native food markets of Blantyre and Limbe reacted immediately to the poor grain crop and by August prices were mounting.

Many natives, inhabitants of or long resident in the district, could obtain food from their own gardens or through connections outside but strangers working in Blantyre or Limbe were beginning to find great difficulty in obtaining grain by the end of the year. The shortage will continue until the middle of March when the early sorghum crop, bulrush millet and green maize will begin to come in.

In the Blantyre and Cholo districts heavy purchases of maize by European estates and firms for feeding their own native labourers led to over-selling on the part of villagers and towards the end of the year many would have been glad to have the maize they had so foolishly sold.

In a few small areas on the Lower River grain was desperately short by the end of November, in the villages of Ndenguma, Ntukuso and Chataika near Port Herald township and in parts of the areas of Native Authorities Chipatula, Katunga, Kasisi, David, Mlolo and Nachikadza. Crops along the foothills south of Port Herald, mostly millet, and in the Masingere district on the Chikwawa—Lower Shire border were fairly good and reasonably cheap maize was obtainable from the Cholo and Chikwawa foothills up to the end of the year.

Maize. Germination in November and December (1937) was good and growth up to the end of January was excellent. Many of the earliest gardens were in flower by the middle of the month. During late January and early February excessive moisture, lack of sunshine and low soil temperatures began to show their effect on the crop and by the middle of February, when the break in the wet weather came, gardens everywhere were carrying tall well-grown crops with unhealthy yellow leaves and small undeveloped cobs. It was most generally realised at that time how poor the crop really was The short hot dry spell followed by more heavy rain in March came too late and was too short in duration to save the crop. Yields everywhere were about half to quarter their usual size.

The foregoing remarks apply generally to the whole of the area under review, with a few exceptions, but on the Lower River the bad weather conditions were further aggravated by heavy floods. A large crop of maize is grown yearly on the dimba lands and practically the whole of this was lost early in January.

Harvesting of the main crop began in April and lasted until the end of May.

Witchweed (mostly *Striga aspersa* and *asiatica*) was fairly common in gardens on the Highlands and on the high drier land of the Lower River; it is seldom to be found on the low-lying dimba lands but whether the annual flooding keeps it under control is not known. On the Lower River natives have begun to show some interest in handpulling but in the Highlands it has been impossible so far to rouse much enthusiasm over control measures.

A head smut, caused by the fungus *Sorosporium reilianum*, was widely distributed but in no area was its presence sufficiently concentrated to cause appreciable loss in yield.

Owing to the small sorghum seed stocks and the reluctance to plant sorghum during the bad locust years a great deal of land on the Lower River is being planted with maize which would be better under millets.

Machewere. (*Pennisetum typhoideum*) On the Lower River, the only district in the area in which the crop is grown to any extent, yields were good and appreciably improved the food situation. Owing to excessive rainfall and rather late planting the crop in Native Authority Kasisi's section, Chikwawa district, was poor. Natives in the flooded areas were able to exchange fish for machewere with people from the hill districts and there is no doubt that had this crop failed, as well as the maize, there would have been a very serious famine on the Lower River.

Harvesting commenced in the middle of February and continued into March. Heads were small and seed selection in the field would well repay the native. On the Mafumbe demonstration plot careful seed selection, from the ordinary native seed stocks, has produced an excellent type of large headed *machewere* and all Native Agricultural Instructors were provided with heads to take round with them to show to natives.

A certain amount of smut, caused by *Tolyposporium penicillariae*, and a green ear mildew, caused by *Sclerospora graminicola*, were found in native gardens but the incidence was small and had little effect on the yields.

Small amounts of seed have been distributed to natives of Native Authority Somba in the Mpemba Hill area, Blantyre district.

Mapira (*Sorghum vulgare*) The area under this crop was larger than last year's but is still much smaller than it used to be. In the Lower Shire district the lighter land can produce larger yields per acre of *mapira* than maize and once the present locust menace has disappeared natives can safely plant a far larger acreage than they do now. In the Chikwawa district a much larger proportion of land is suitable for maize although a large acreage of *mapira* is grown. In the Cholo foothills along the railway between Sankulani and Sandama and in the Neno hills there were large gardens but in the Highlands round Blantyre and Limbe the crop is not popular and only the variety *Namudzi*, usually ratooned, is grown.

Yields were good everywhere and on the Lower River the early varieties, principally *Kachiliwendi*, were in head by the end of February. Green heads of *Namudzi* were being picked in the Highlands at the same time. The main harvest was in May.

In the Mtengula—Kanono area, along the north bank of the Shire River and to the east of the old Matope Bridge, 350 natives were given small quantities of sorghum seed for planting. The land in this area is definitely more suited to sorghum growing than maize.

Another collection of sorghums from the Lower River was made during the season and the seed has been sown on the Port Herald Experimental Station and on the Empire Cotton Growing Corporation's station at Salima.

Very little disease or insect attack was found. Witchweed (*Striga spp.*) was bad in some areas in the Highlands and was in evidence in parts of the Lower River. There is little response at present in the Highlands to the propaganda on hand-pulling this weed.

Maere. (*Eleusine coracana*) Yields everywhere were good, on plain and hills. There was a definite increase of acreage over that of 1937.

The main crop was planted out from the nurseries during January and February and a few of the earliest gardens were harvested late in March. The main crop was ready in May.

Oilseeds. The acreage under groundnuts increased again this year and yields were good everywhere. Since 1935, when Rosette disease was so bad and most of the natives seed stocks were lost, the increase in acreage has been steady and it is hoped that it will continue. A small amout of *Cercospora* leaf spot and Rosette was seen during February but neither disease caused any serious diminution of yields. The crop was lifted during April.

Close planting in native gardens is encouraged throughout the area and there are signs that the advice is being followed. A large percentage of pure stand groundnut gardens are being planted at spacings of twelve to eighteen inches instead of twenty four to thirty. The largest part of the crop however is still grown between maize, generally along the top of the maize ridge, between the maize plants. This practice is not being discouraged but where a native prefers to grow his groundnuts in a mixed garden he is being advised to plant his groundnuts in two close-spaced lines one on either side of the ridge about half way down the ridge instead of along the top. In this way the groundnuts can be planted closer and help to protect the ridges against erosion.

On one of the demonstration plots this season a half acre plot of groundnuts yielded at just under the rate of one ton of nuts in shell to the acre. The site had been a native garden for some years before it was taken over. The nuts were close spaced, at approximately 8 inches apart, and after the first weeding with a hoe and a second light hand weeding the crop covered the ground sufficiently to smother out all further weed growth.

The number and size of gardens planted at the end of 1938 show a further response to propaganda which has through the year been urging the native cultivator to increase his groundnut acreage, not with the object of selling the produce but with the idea of varying and improving his diet.

The acreage under sesamum remains small and constant. The Lower River could produce a large tonnage should there be a market for the crop and in the bad locust years it would have a great advantage in that it appears to be quite immune to flying swarms and hoppers alike.

Rice. On the Lower River and in certain parts of the Blantyre district a small rice crop provided an extremely useful extra food supply during the recent food shortage. In the Munga area in the Lower Shire district natives planted a small acreage as a result of direct encouragement from the Agricultural Supervisor and District Commissioner. Yields everywhere were good although in Native Authority Lundu's area, Blantyre district, some of the crop was buried under sand, through the bursting of the Linjisi banks, and was a total loss.

In parts of the districts of Native Authorities Lundu and Chigaru which lie along the Shire and Linjisi rivers there is some excellent rice land, only a small proportion of which is planted annually. The failure of the maize crop has resulted in an increased acreage being planted for harvest in 1939 in this area. On the Lower River there is a definite increase in the area under rice. With the extensive and long continued flooding by the Shire river large areas that once grow maize, and will do so again when the flood years are over, are now swamps and admirably suited to rice cultivation. Six hundred lbs. of Faya rice from Kota Kota have been distributed to natives on the Lower River for planting with the 1938 rains.

Pulses. The pulse crops were good everywhere and there was a surplus in many parts, particularly of *cimbamba* and *kayera* (*Phaseolus vulgaris* varieties). The first crop of these beans was in pod by February and ready for harvest in March. There was a particularly heavy crop at Mwanza. A second crop of *cimbamba* was planted at Sambani Hill and in the Neno Hills during April.

Cowpeas (*Vigna spp.*) yielded well and in February, when the main crop was in flower, second plantings were being made. Natives in the Mtengula-Kanono area were given small free issues of cowpea and green gram seed.

Cassava and Sweet Potatoes. Root crops fortunately gave heavy yields and directly the approaching shortage of maize was seen natives were urged to increase their cassava and sweet potato gardens. It is difficult at first to understand why natives do not plant large acreages of these crops without being urged, directly they see the failure of their maize. The fact remains that they are very reluctant to plant more, however strongly they are urged, their reluctance being due partly to a hope that something will turn up, partly to a desire to keep the maize garden area intact and not to encroach on it with another crop which may mean late maize planting the following year, and partly of course just to laziness.

On the Lower River sweet potato nurseries are planted on the high land during the early part of the season ready for the release of the dimbas from flood water about April and May when the main crop is planted. This year the Agricultural Supervisor, Mr. E. E. Carrall-Willocks, was very successful in persuading natives to extend their nurseries into gardens on the high land instead of waiting in vain for the flood water to recede. This action, which gave natives a very large sweet potato crop, relieved the food situation considerably.

Cuttings of all cassava varieties in the writer's district were sent to the Agricultural Officer, Mlanje, for work on mosaic disease. In addition a small collection of the Cholo varieties has been made and planted out at Masambanjati Coffee Station.

On the Lower River a certain amount of damage was done to the cassava crop by white scale which attacked the main stems and branches.

2. Economic Crops

Cotton. Seed distribution commenced early in November in the Highlands and on December 28th on the Lower River.

Amounts of seed distributed in the various districts were as follows:—

	Tons	No. of Seed stores
Blantyre	23	3
Central Shire	77	3
Chikwawa	413½	10
Lower Shire	872	10

Serious planting on the Lower River commenced about the second week in January and continued during February and well into March. In the Highlands the main planting took place during December and early January with some late gardens planted in February. The season was extremely favourable to the crop but insect attack, particularly in the Highlands, depreciated the yields considerably.

The gardens census on the Lower River revealed a decrease from 1937 of 13.0 per cent, the fall being spread over the whole of the area with the districts most affected by flood showing the greatest fall. The size of the average garden was 1.85 acres approximately and it was estimated that 82,700 acres of land were under cotton—a decrease from 1937 of 7 per cent. These figures include the cotton grown in the Cholo foothills. It will be noted that although the number of gardens was smaller than last year the size of the individual garden was slightly larger.

In the Highlands the number of gardens was considerably smaller than in 1937; the Blantyre district showing a decrease of 38.2 per cent and the Central Shire 7.6 per cent. In the Blantyre district the size of the average garden was 1.43 acres with approximately 670 acres under cotton—a drop in the cotton acreage of 548 acres (45 per cent). In the Central Shire district the size of the average garden was 2.07 acres and the area under cotton approximately 2,842 acres a decrease of 879 acres (23.6 per cent). In will be seen that in both these districts the size of the gardens is smaller as well as the number.

It is estimated that the total amount of seed cotton produced on the Lower River this year was 5,690 tons but that only 3,260 tons of this found its way to the Nyasaland markets, the rest going to Portuguese markets across the border. The figure representing the loss, 2,430 tons, is admittedly an estimation only but it is believed to be fairly accurate, tending to underestimate the amount rather than exaggerate it. Taking into account this estimated figure, the 1938 a crop showed an increase over 1937 of 2,690 tons and fell short of the record year's production of 1935 by 795 tons. In the Highlands the Blantyre district crop of 72½ tons showed a decrease of 37½ tons from 1937 and the Central Shire crop of 252½ tons a decrease of 162½ tons. The following table shows the cotton production in tons of seed cotton during the past few years:—

District	1938	1937	1936	1935	1934	1933	1932
Lower River	5,690 (est.)	3,000	4,624	6,485	2,870	2,012½	2,656
Blantyre and Central Shire	325	525	408	593	163	159½	42

The crop in the Blantyre and Central Shire districts would have been a heavy one had it not been very badly attacked by red bollworm. Growth in the early part of the season was good but by the end of March flared buds and pierced bolls could be found in all native gardens. By April the attack was definitely bad and rough counts made during the month at Kambalame, Wamkulumadzi and Lisungwe showed that 50 per cent of the fully developed bolls on the bushes were carrying bollworm. A great deal of the crop had of course already been shed by then and practically the whole of the early crop and a very high percentage of the main crop was taken. Bollworm eggs were easily found on plants up to the end of May and could still be found, with a little difficulty, up to the end of July. Markets were opened between August 1st and 16th and again between September 2nd and 10th. The price paid varied from 23 to 27/32nds pence for No.1 grade from 17 to 20/32nds for No.2 and from 5 to 6/32nds for No.3. Grading was good, a great improvement on 1937. The yield per acre of seed cotton was estimated to be 241.77 lbs. in the Blantyre district and 199.16 lbs in the Central Shire district.

On the Lower River growth was excellent and although red bolloworm attack was severe it was not so severe as in former years. Eggs were found from February onwards and the attack was most noticeable between the end of March and the middle of May. Cotton Stainers, *Dysdercus spp.*, particularly *D. intermedius.* began to appear in May but were not found in large numbers until the end of July and then only in certain localities. In the Muona-Chinsomba district an outbreak of internal boll rot destroyed approximately 500 tons of seed cotton, practically the whole of the late main crop. The Agricultural Officer, Mlanje, identified the causative fungus as *Nematospora gossypii.* Cotton bolls infected with internal boll rot were found in other parts of the Lower River and were also sent for examination. Bolls sent from the Cholo foothills were found to contain a *Fusarium* more often than the *Nematospora.* Markets were opened on July 18th and were closed at the end of October. Prices paid varied from 23 to 30/32nds for No. 1 grade, from 17 to 22/32nds for No. 2 and from 6 to 7/32nds for No. 3. The cotton offered for sale was well graded. The yield per acre was estimated to be 242 lbs.

The new system of auctioning the right to buy at each market worked well. Some alterations and re-adjustments will be made before next season opens but the main objects of the change, to attain better grading and better treatment at the markets for the Native grower, have been achieved. Natives unfortunately have not quite grasped the principle of the system in spite of numerous explanations, and blame the system for the low prices at the markets. Next season representative natives will be asked to attend the auction so that they can see for themselves that there is competition for their cotton and that the markets are not divided amongst the buyers by arrangement with Government.

Once again special attention was paid to uprooting and although at first glance the number of defaulters seems depressingly large—167 in the Lower Shire district and 154 in Chikwawa—all cotton was out of the ground and burnt by the first week in November except in one or two cases of absentee growers on private estates in the Chikwawa district. Cases of defaulting from this cause are becoming increasingly rare as Native Authorities and village headmen gradually acquire a feeling of responsibility for their people. Both Lower River District Commissioners gave the Agricultural Supervisor, Mr. Hayes, (who was in sole charge of the uprooting, Mr. Wilcocks being on leave) every assistance possible, Mr. P. B. McDonald, by his attitude directly cotton uprooting propaganda commenced, convinced natives of the necessity for carrying out the law and Mr. K. W. Switzer made an arrangement whereby Native Authorities employed labour to uproot

and burn any cotton left after Octeber 31st, recovering the amount paid to the labour from the fines imposed on the defaulters, a system which worked extremely well. In the Blantyre and Central Shire districts every assistance was given by the Administration and in the Lisungwe district, where it appeared at first that there might be a large number of deafulters Mr. W. A. N. Thatcher dealt so firmly with would be offenders that within two weeks the district was free of all plants.

The controversy over the vexed question of late and early planting continues. This season has been a distressing one for both sides because early and late plantings both did well. Certainly very late sown cotton on very light soils came to nothing and very early sown cotton on heavy soils grew rankly and produced very little crop. It could be argued that if the Muona-Chinsomba cotton had been planted earlier it would probably have missed the attack of internal boll-rot but it could equally well be argued that if the Ndinde Marsh and riverside cotton had been planted earlier it would have produced no crop at all. There is no one optimum planting date on the Lower River that will suit all soils and all seasons. The range of planting dates is wide and so long as seed is given out sufficiently early, as is done now, the native can be trusted to plant at the proper time. Far too much emphasis has been laid on time of planting in the past with absolutely no value at all to the cotton crop. Time of planting is blamed for so many things and juggling with it has been proposed at one time or another as a cure for most of the many ills to which cotton on the Lower River is subject. Actually it is fairly safe to advocate late or early planting because it is extremely doubtful whether anything short of sheer brute force would make the native plant at any other time than the one he has himself chosen. The native is fairly tolerant of European methods but he still stands firm as adamant against attempts to change his normal time of planting cotton. He has so far resisted attempts to make him plant earlier and attempts to make him plant later and it must by now have struck him that he is as likely to be as right as anybody.

There is no doubt that the number of cotton growers will be much smaller next season. The decrease has been a steady one since 1935 and will probably continue. This does not necessarily mean of course that the crop will grow steadily smaller; this season has shown that quite clearly. Price and poor yields, due to bad seasons or insect attack, are probably the two chief reasons but in the writer's opinion a little more attention to the marketing of the crop would be repaid tenfold. Arrangements are being made which will, it is hoped, put an end to congestion at markets but sanitary arrangements are still practically non-existent and often no water is available. Sometimes it has been impossible to provide amenities without incurring unjustifiable expense but there have been cases, there were cases last season, when a little trouble would have made cotton marketing a very much more attractive proposition to the native. The native has not yet reached the unhappy economic state when he must produce a money crop or die of hunger; that time will no doubt come but until it does he can still plant cotton or not as he feels inclined. If his cotton is wanted he must be made to feel that it is wanted: he must be given decent facilities for marketing his crop and reasonable treatment at the markets. The market in fact should be an attractive place which the native looks forward to attending and not a cross between a football scrum and a concentration camp.

Many of the seed stores, particularly on the Lower River where seed has to remain in them for some time, are badly infested with cotton stainers, *Dysdercus spp.* These increase towards the end of the year and by the time the stores are opened in late December the seed is a mass of adults and nymphs in all stages. The building of permanent seed stores is contemplated in certain places with a view to seed treatment during storage.

Wheat. The native crop on the Neno Hills was very small. A census made in April showed only 24 native growers, all in Native Authority Dambe's Section. The earliest garden was planted early in February and the latest in May; the majority were planted during March. There was very little stem rust (*Puccinia graminis*). There is a small market in Blantyre which will take up to 8 tons annually and it is hoped that the Neno Hills will be able to cater for this.

Small observation plots were planted at Dambe Village, Neno Boma and Blantyre to note the incidence of stem rust. At Dambe village two varieties only were planted—seed from Dedza and Karonga—but at Neno Boma plot six wheats from Kenya were planted in addition. At the Naperi plot, three wheats from Cyprus were planted as well as the other eight.

At Dambe two plots were planted on February 9th and two more on April 28th. The earlier plantings harvested early in June showed no signs of rust, made good growth and yielded well. The plants in the later plots showed signs of rust when about 15 inches high but the disease was never bad and yields were fair. In both cases the crop was harvested about four months after planting.

The six wheats from Kenya and the two local wheats planted on the Neno Boma plot on April 28th made poor growth and although they showed no sign of stem rust yields were poor. The site, chosen hurriedly, was a poor one and will be changed next season.

At Blantyre the eight plots planted at the end of April came into head in late July. The planting date was definitely too late for the Blantyre district and the Cyprus wheats planted at the end of June came to nothing. All plots had to be watered. About the middle of July stem rust appeared on the leaves of all the wheats, the two local varieties from Dedza and Karonga, and the Kenya wheat 117A suffering most. The Agricultural Officer, Mlanje, identified the rust as *Puccinia graminis.*

The names of the six Kenya wheats were 117A, 58F (L.1), B.256G, Sabanero, Australian 26A and 130 B.6B. The three wheats from Cyprus were Kyperounde, BX1P.1, and Psathas. Sabanero made good growth and seemed to be best suited to the conditions under which the wheats were grown.

Some of the original seed has been kept and plots will be planted again next season.

Coffee. At the end of the year there were 65 native coffee growers in the Masambanjati area. Forty of these produced 3,246 lbs of coffee which was sold locally for £47 : 18s : 6d.

Yields from the gardens were extremely poor. Early in the season Cameron Bugs (*Antestia variegata, Thunb*) were found in large numbers on the bushes, feeding on the berries and young shoots, and on examination by the Agricultural Officer, Mlanje, the fungus *Nematospora Coryli* was isolated from the berries. Between eighty to ninety per cent of the berries examined had the endosperm partially or wholly destroyed and in addition to the *Nematospora, Colletotrichium gloesporiodes, Penzing* and two bacteria, were frequently isolated from the decaying endosperm (vide report of the Agricultural Officer, Mlanje).

In addition to direct attack by insects and fungi the bushes show signs of general unhappiness. Young leaves show definite signs of chlorosis and early in the season a deficiency was suspected. With the Agricultural Officer, Mlanje, to whom the writer is much indebted, a plan of work was drawn up and compounds were added to the soil or sprayed on to the leaves to try and obtain some idea of the deficiency. Unexpectedly interesting results have been obtained from this preliminary work but no report will be submitted until the treatments have been repeated in greater detail.

Harvesting commenced in June and it was not until pulping and fermentation of the crop began that the virulence and range of the attack on the berries was realised. Natives were advised to use a smoke gun in their gardens, driving the Antestia bugs into the centre of each bush, as it was smoked, and so down the stem to ground where they could be collected by hand and destroyed. The disease had too strong a hold for this to make much difference this season but it is hoped that natives will be willing to give the method a fair trial next year. In spite of the disease it was noticeable that gardens which bore a very heavy crop last year, the first year of bearing, bore a poor crop this year.

Five new gardens were opened on Masambanjati Hill this year and one of the original growers uprooted his bushes and planted maize. An account of the work done on the Masambanjati Coffee Station will be found elsewhere in this report.

Buckwheat. Trials with buckwheat have been made in various parts of the area, on experimental stations and demonstration plots, and a fair idea has been obtained of where and under what conditions it can be expected to give a crop. Natives have been given samples of grain to try as food and reports received show that although not extremely popular it would be used in time of shortage. Before flour can be prepared from it in the usual native fashion in the native ntondo the seed should be heated on an iron over a fire for few minutes. It may in the future find a place as a native green manure crop.

On the Lower River, on the lighter soil, buckwheat must have 3-3½ inches of rain during its early growth and can therefore be planted in most years with the mid season rains and give a crop. On the heavier land 2 inches appears to be enough to carry the plants through the early stages and on the dimbas so long as there is enough moisture for germination the crop grows and yields well in the middle of the dry season. It must be realised that these are the absolute minimum

requirements in the way of moisture and that for good yields more is necessary. On the other hand heavy beating rains will smash the young plants down and two seedings on the Port Herald station were lost in this way. It would appear that the best time for planting on the Lower River is either early in November with the early rains or about March when the heavy rains are over. The elegant, or stinking, grasshopper (*Zonocerus elegans*) destroyed one seeding at Port Herald.

In the Highlands, in the Blantyre district, trials show that a crop can be obtained from sowings made at almost any time between November and March and at Masambanjati from sowings made at almost any time during the year.

3. EXPERIMENTAL.

Port Herald. Out of the 50 acres on the Mpala Experimental Station 30 were allowed to go back to bush and the remaining 20 were put down to bulk food crops. With only one Agricultural Supervisor on the Lower River for the greater part of the year and with none at all for two months it was a complete waste of time and money to try and run experimental work from Blantyre. In the 1938-39 season experimental work on groundnuts and on the interplanting of bulrush millet and cotton will be carried out and observation plots of most of the native grain and pulse crops will be planted. Good yields of groundnuts were obtained, most of the crop being distributed in the district for seed. Bulrush millet also yielded well and seed of this too was distributed. As a general rule no seed is distributed free to natives but this season with the general food shortage on the Lower River an exception to the rule was made.

The dimba station was flooded early in January and remained under water until May. Small late crops of maize, beans and sweet potatoes were obtained and used for feeding the labour.

Masambanjati Coffee Station. A report on the native coffee crop in the Masambanjati area has already been given under Economic Crops.

The four small observation plots on the station gave exactly 19 lbs of unhulled coffee between them. All bushes were badly attacked by *Antestia variegata Thunb.* In plot B half the *Leucaena glauca* bushes along the terrace have been removed as the heavy shade was causing the coffee bushes to shed their leaves and berries. The Tung Oil in two of the four observation plots, B and C. came into bearing this year; the trees are now four years old. In plot B *Aleurites montana* has made good growth and by the end of the year most of the trees were carrying a fair crop. In plot C *A. Fordii* has made poor growth and a few of the trees only are bearing a very small crop.

On the 2-acre plot planted in April 1937 both *Montana* and *Fordii* have made poor growth. The plot runs right along the top of an exposed ridge and this exposure to the cold damp weather, which sometimes sets in for days on end in this area, probably explains the unhappy appearance of the trees. Scale has attacked many of them, and the leaves have been eaten badly. The whole plot was planted with groundnuts, the seed being distributed on the Lower River and used for larger plantings on the station at the end of the year for next season's crop.

Fourteen small plots of shade trees are planted out from nurseries early in January—*Acrocarpus fraxinifolius Pithecolobium Saman, P. dulce. Albizzia lebbek. A. stipulata, A. moluccana, A. Fastigiata, Millettia oblata, Derris robusta, Acacia decurrens, Gliricidia maculata, Callitris robusta, C. calcarata and Cassia siamea. Buckwheat, Calopogonium Mucunoides, Dolichos hosei* and Soya Beans (var. *O-too-tan*) were planted under the trees.

The Queen pineapples from Natal are well established and several plants began to set fruit by the end of the year. Suckers from the plants will be distributed next season to planters and natives.

A register has been compiled of all native coffee growers in the area. Notes are kept of the cultivation, shade and cover crops planted, crop harvested, soil conservation methods and general treatment of each garden. A copy of the register is kept on the station.

Experimental work on coffee was continued during the year and three more plots were laid out as follows:—

Each plot is 104 ft. x 72 ft. and contains 9 rows of 13 plants spaced 8 ft. x 8 ft.

In each plot 4 rows will be pruned in the agiobada and 5 rows in the single stem system. The layout was designed by Mr. A. B. Cormack before the writer took charge of the station.

Plots 1 and 2 have been planted, the former with 6-7 months' old plants from the nursery and the latter with 12-13 months' old plants. Plants 18-19 months' old will be planted in plot 3. Plot 2 had to be watered occasionally through the dry season, a rather expensive operation which would not of course be necessary under ordinary circumstances. Should planting out at 12 months' old prove to have definite advantages over planting out at 6 and 18 months the nurseries would be sown at the beginning of one rainy season and planted out at the beginning of the next.

A plague of rats at Masambanjati did considerable damage to groundnuts in the store. Barium carbonate mixed with maize meal porridge was used with a certain amount of success but a ceiling of half inch wire netting had to be put in eventually.

4. Demonstration Plots.

Four demonstration plots are now established on the Lower River at Tengani, Muona, Mafumbe and Nkadana, and one in the Blantyre district at Kapeni (milepost 14 on the Blantyre-Matope road). One more in the Blantyre district is being opened at Kumtaja (milepost 15 on the Blantyre-Mwanza road) and it is hoped that three more will be opened at the end of next year, two on the Lower River at Nachikadza and Ngabu and one in the Blantyre district at Chigaru (milepost 34 on the Blantyre-Matope road, by the old Matope Bridge). The plots continue to hold increasing native interest and each one has in the past year played an important part in the agriculture of the surrounding locality. It is a great pity that there is not sufficient money to provide all the plots that have been asked for by various Native Authorities.

All plots at present are run in the same way, with a capitao in charge and a certain amount of paid labour to assist him. In one or two cases the capitao is in uniform and does very little actual work himself, in the others the capitao wears no uniform and does most of the work. Each plot on the Lower River consists of 3 acres and is continuously under cultivation. In the Highlands one plot is only 2½ acres, owing to difficulty in obtaining land on the site, and the other will be 10 acres. Nothing is attempted on the plots that a native could not do for himself and all work is done with the native hoe and axe; all buildings, grain stores etc. are built of materials that any villager can obtain from the bush; the crops grown are those of the district, with very occasionally an introduction. Natives are not led to believe that the methods used are infallible. They are encouraged to come and look at what is being done and the capitaos-in-charge are encouraged to take a pride in the work; they are being taught to encourage natives in the district to visit the plots. At present nothing more ambitions than two course rotations are being tried and the native method of inter-cropping maize and cotton and millet and cotton by the side of these crops grown in rotation is to be found on all plots. A small piece of land has been set aside for continuous cotton growing with a view to ascertaining the rate at which complete exhaustion is reached and what yield is obtained after exhaustion has been reached. (The writer believes that a number of gardens on the Lower River have already reached this state and are now producing a steady 80 to 120 lbs. of seed cotton year after year). Pigeon pea is used as a restorative crop and pulses and groundnuts are used in two course rotations with grains and cotton. Two good dry-season diggings are given, one after the crop is harvested, the land being left in large clods, the other before planting time when the weeds are hoed out and composted.

Fields are kept clean of weeds and well but not excessively cultivated. Seed selection is practised, grain is kept in rat and insect proof mudded grain stores and compost is made during the rainy season. Brief notes on the individual plots follow.

Muona.—This plot was run by the Empire Cotton Growing Corporation during the 1937-38 season but has now been returned. The cropping programme remained unaltered.

Cotton yields were extremely poor, a heavy infestation of stainers destroying the whole of the late crop. The highest yields came from pure stand cotton; interplanting with maize and *machewere* (*Pennisetum typhoideum*) depressed the yields considerably. It should be noted in this connection that interplanted cotton is generally later in developing than pure-stand cotton and that therefore without the stainer attack the later yields from the interplanted plots might have pulled up to the pure stands. The highest yields were 460, 320 and 260 lbs. of seed cotton per acre, all pure stand, and the lowest 130, 140 and 180 lbs. per acre, all interplanted.

Grain yields were good, maize nearly reaching 1 ton per acre, in cob, and machewere giving well over ¾ ton per acre of threshed grain.

Tengani.—Opened during 1937 at the last moment and only just ready by planting time. The site is not really on maize land at all and although the cropping for 1937-38 followed the lines of the other plots the layout for next season has been altered considerably. Groundnuts will take the place of some of the cotton and millets, particularly sorghum, the place of some of the maize, sorghum is grown in native gardens in this area and groundnuts are being encouraged in the district to give some of the cotton land a rest. The highest cotton yields (556 and 434 lbs. per acre) came from pure stands, the lowest (280 and 264 lbs. per acre) from interplanting with maize and *machewere.* Yields of maize and *machewere* were depressed when interplanted with cotton.

Nkadana.—Was opened during 1937 and the first crops were taken off this year. The highest yields of cotton (920 lbs. per acre) came off the plot of mixed *machewere* (*Pennisetum typhoideum*) and cotton, the lowest (384 lbs. and 392 lbs. per acre) from another plot of cotton interplanted with *machewere* and from maize and cotton interplanted. Plots of pure stand cotton gave 756 and 528 lbs. of seed cotton per acre. Unfortunately all grain yields were hopelessaly muddled by the capitao in charge. The figures in any case mean very little but show that very much higher yields are obtained on the plot than on surrounding gardens.

Mafumbe.—This plot has now been cropped for three years and natives in the vicinity have decided that the methods used on the plot give better results than their own and are worth adopting. Consequently eight of them have agreed to a proposal made by the Agricultural Supervisor and have had their gardens squared off. They have planted up a proportion of their land with close-spaced pigeon pea as a restorative crop and are carrying out simple rotations.

Seed selection of *machewere* (*Pennisetum typhoideum*) has succeeded in producing an excellent crop this year with large and well formed heads. Each Native Agricultural Instructor was given two heads to carry round with him on his travels.

The highest yield of cotton (860 lbs. per acre) came from a pure stand, the lowest from another plot of pure stand (552 lbs. per acre) and from a plot of cotton and machewere interplanted. Intermediate yields of 600, 700 and 800 lb. of seed cotton came from cotton interplanted with maize (two plots) and cotton interplanted with *machewere.*

The highest and lowest yields of maize and *machewere* came from plots interplanted with cotton, intermediate yields from pure stand plots. Machewere yields of ¾ ton per acre are satisfactory but the demonstration plot is still not able to teach the native much about his maize. The highest yields are still just under ½ ton per acre.

Kapeni.—Was opened during 1937 and its first cropping was in the 1937-38 season. It is a poor piece of land which has been worked out during past years and was willingly given to the Department by Native Authority Kapeni. The soil is in extremely poor heart at present and is just on the edge of the chocolate and red loam area. The predominant tree types are *Brachystegia-Isoberlinia spp.* with some *Uapaca Kirkiana.* There is small rocky out-crop in one field.

With the exception of two ½ acre fields the whole of the plot was put under close-spaced pigeon pea. One of the small fields was sown with groundnuts, bunch type, at 6 inch spacing, and the other to maize. The groundnuts gave 770 lb. of unshelled nuts to the half acre and the maize was a complete failure.

Kumtaja.—A demonstration plot is being opened in Kumtaja's district at mile 14 on the Mwanza road. Native Authority Kumtaja has asked for this and eventually the plot will be run as a small-holding. A 10-acre piece of land has been set aside by the Native Authority and the loan of cattle offered. It is proposed at present that three acres of the holding shall be put under food and cash crops and about five put down to grass for sectional grazing ; of the remaining two acres one will be planted with green crops for silage and the other kept as a small tree plantation. The plot will be run by a native family without paid help but with a monthly wage. All produce at first will be treated as belonging to the Department but the family will be able to purchase it if they wish to. Eventually it is proposed that the holding be handed over to the family but the details have still to be worked out. It is not certain yet exactly what acreage and what head of livestock are necessary to support a family and keep them in comfort and happiness on the land but in the next two or three years this Kumtaja plot should give some useful information.

Chiromo.—A series of plots to test the efficacy of crushed cotton seed, from Mr. J. J. Souter's mill at Chiromo, as a manure for cotton have been laid out at Chiromo. The manure was applied early this year and a small crop of buckwheat taken off the land. Cotton will be planted early in January 1939.

Chinsomba.—A small plot is being established at Chinsomba, in the middle of the Muona-Chinsomba area where the outbreak of internal boll rot was so bad this year. The plot will be fitted with a rain gauge and other meteorological instruments to try and ascertain if weather conditions vary here from other parts of the lower Shire plain and how far they may be responsible for the incidence of stainers.

5. Native Agriculture in General.

Lower River Food Shortage. The greatest problem on the Lower River is to ensure an adequate food supply throughout the year from one harvest to the next. When natives are hungry from December to February their gardens, which at this time require most attention, receive the minimum of cultivation and cleaning and are planted with any old seed that hasn't been eaten. This of course makes a food shortage the following year almost inevitable and so a vicious circle is set up. One of these days the writer hopes to see a communal grain store in every village—not necessarily of brick and cement but of simple construction, of pole and mud and grass—under the direction of the village headman. Details of a scheme have already been discussed with members of the Administration and Native Authorities. Meanwhile subsidiary food crops are being introduced, or developed if they are already there.

Date palms were introduced this year from the Bwanje Valley and one of each sex was planted on the demonstration plots at Tengani, Mafumbe and Nkadana on the Experimental Plot at Chiromo. Natives were so impressed with the palms and with the propaganda initiated by the Agricultural Supervisor, Chikwawa, who gave a free issue of dates to all bystanders at the planting ceremonies, that a further importation of stem shoots was made. This second consignment of ten palms of each sex were given out in pairs to various Native Authorities and natives on the Lower River during November. Both the original and second plantings are well established.

A very useful subsidiary food crop on the Lower River is the plantain. It grows well over practically the whole of the area and the many large groves testify to its popularity. Unfortunately very few natives have any idea of how to look after their plants and yields are much smaller than they should be. Nothing very ambitious is being attempted so far but small demonstrations are being made in the Chikwawa district and natives asked to watch the results. Large clumps are being thinned down to groups of three plants, the discarded plants being chopped up and dug in round the roots of those left.

Ndirande Welfare Club. A certain amount of work has been done on gardens of members of this club which has its headquarters just outside Blantyre. Four gardens, one belonging to the chairman, were marked out for contour ridging early in the season and all owners carried out the work themselves promptly and efficiently. Each was then asked what crops he wished to grow and a simple rotation was made up from the crops named, the small areas between the contour ridges being treated as separate gardens. An agreement was made with each grower that a certain number of the small gardens should be planted with pigeon pea. The agreements were faithfully carried out.

The soil of most of these gardens is almost exhausted. It has been cropped continuously for an incredible number of years until at last it appears to have reached a stage at which it can continue to give a very poor crop of maize for ever. As however erosion has by now reached an acute stage and practically the whole of the top soil has gone large parts of the area will be completely barren in the next few years unless something is done.

Compost. Work on training capitaos in compost making continues and no native can become a Native Agricultural Instructor in the writer's area until he has been through a three months' course.

The writer is very doubtful whether the full Indore method will ever find favour in the eyes of the native cultivator. It is far too complicated for him and the almost continuous work involved prejudices him against it; the benefits obtained from applications of compost would have to be very spectacular indeed to make its manufacture seem worth while.

Most villages however have ashpits into which the sweepings of the village, vegetable refuse etc. are thrown and an attempt is being made to use these pits for compost making. A start will be made in nearby villages, a capitao going round and teaching natives what to throw in the compost pit and what to throw in the can and bottle pit; when to add manure and when a spot of water would do good. The villagers will be urged to make future pits wide rather than deep so that an occasional turn can be given.

6. Soil Conservation.

Two trained capitaos under the Agricultural Supervisor, Chikwawa, have worked on native gardens in the Chikwawa foothills, marking out contour ridges which were built by the owners. The District Commissioner, Chikwawa, gave his full help and co-operation and by the end of the year a large area, comprising some 50 gardens covering approximately 150 acres of land had been fully protected. In most cases surplus water was run off into strips of wood land surrounding the gardens.

In the Cholo district owing to the firm action taken by the District Commissioner the programme laid down by the Soil Erosion Officer has been carried out practically in full.

It is interesting to note the intense and univeral dislike of the native for strip fallows; wherever he has been given the choice he has chosen to contour ridge his garden.

In the district round Mpemba Hill a certain amount of work has been done with boxing ridges. A great deal of the maize in this region is planted on ridges, sometimes roughly on, but more often well off, the contour. The work was not commenced until the end of the year, just after the rains had started, and nothing else could be done to prevent erosion but the building of the small transverse ridges. A few natives were persuaded to carry out the work and the results were so striking that others quickly followed suit. The work was extended to Malabvi Hill and continues. In future the capitaos who mark out the gardens for contour ridging in the dry season will be turned on to instruction in boxing ridges immediately the rains being.

A certain amount of help in marking out contour ridges has been given on European Estates. Work on stream bank conservation has been carried out in conjuction with the Assistant Conservator of Forests and the District Commissioners concerned.

It has not always been possible to enforce the eight yard's limit, particularly in the Central Shire district where the area of dimba land is very small, but all natives with gardens along streams and river banks are being made to carry out some form of protection. Natives are being encouraged to plant bananas, mangoes, sugar cane, cashew nuts and trees, for poles or firewood, along the banks of their streams and the suggestion appears to meet with approval. A great deal of planting has already been carried out, mostly so far with plantains or bananas. A small tree nursery for stream bank planting has been started, the land was offered by village headmen in Native Authority Kapeni's (Soche) area and is situated near Chata Village. It has been found that when natives are given young trees they tend to look after them; when they are given seed they seldom produce trees.

7. Miscellaneous.

A check list of Nyasaland grasses is under preparation. It is hoped to follow this with a Nyasaland flora. Varieties of castor oil and strophanthus have been collected by Mr. Hayes, Agricultural Supervisor and the writer.

E. Lawrence,
Agricultural Officer.

Report of the Agricultural Officer, Nchena-chena.

The area covered by the writer embraces the North Nyasa, Mzimba, and West Nyasa districts and, in addition, some help has been given to the District Commissioner, Kasungu. Little, however, has been done in the West Nyasa district on account of lack of staff and scanty knowledge of the agricultural needs of the Atonga of that area.

Major D. N. Smalley returned from leave in March to North Nyasa, where he again made his headquarters at Karonga.

The Agricultural Officer has had his headquarters during the year at Nchena-chena in temporary accommodation, but has spent a considerable time in the district, having been one hundred and nineteen nights on *ulendo*.

2. Meteorological.

The season generally was characterised by a short rainfall, which resulted in rivers and streams being lower than almost ever before during the dry weather; one or two streams went dry for the first time in local knowledge. Rainfall, however, was generally small and well distributed and the shortfall appeared to make but little difference to food and other crops. In Karonga a definite drought in February caused groundnuts to yield below their usual and did some damage to other crops. The Kasitu and South Rukuru Rivers flooded more severely than ever before—an indication of increasing dessication in the southern areas of Mzimba. No frosts appear to have occurred.

The level of the Lake fell during the year to point well below that of the previous season and local opinion has it that the peak of the rise has been reached.

3. Native Food Crops.

Native foodcrops in general yielded well in spite of the shortfall in rain and there was a small surplus in most areas, with the exception of the hill country of Mweniwenya where the rains ceased early and maize was correspondingly poor. A good season was experienced in Mtwaro's section where, in the previous year, they had had definite famine. Groundnuts in the Karonga area suffered from a drought in February and never recovered satisfactorily as a result. In the Misuku Hills there was a shortage of maize but this was mainly due to soil deterioration resulting from overcrowding and overgrazing, with consequent accelerated soil erosion. Any chance of famine was, however, staved off with the *dimba* crops of sweet potatoes.

Rice yields were somewhat depressed by the short rains and not a great deal was bought in at Karonga or Kaporo, though it is not possible to estimate what proportion of the crop is carried over and sold in Tanganyika Territory. Rice in Hara and Deep Bay areas is on the increase and should continue to do so with the expected fall in the level of the Lake.

4. Economic Crops.

Cotton. Previous to the 1937-38 crop cotton had been grown on both *dimba* and *mphala* lands with the result that in any one month there was always some cotton in the ground in North Nyasa. For the current season, however, it was decided to dispense with *mphala* land cotton and concentrate on the late-grown *dimba* crop with the primary object of obtaining an effective close season. This was clearly but little hardship on the natives who had previously grown rain-watered cotton as, in 1937, they had produced approximately 2% of the total crop and the average return per grower had been only 1/1 as against the 21/- of the late-planted cotton grower. In order to alleviate any hardship, groundnut seed was issued free to those who cared to take it—a crop far better suited to their class of soil than cotton, for which they had never had any real enthusiasm.

The issue of cotton seed began towards the end of February and continued until late June, when some replantings were necessary.

Seed Issues in Tons.

	Natives.	Tons. approx.	Increase/Decrease 1937
Florence Bay ...	1	trail plot	Decrease ½ ton.
Deep Bay ...	77	¾	,, 3 tons.
Nyungwe/Vua ...	28	¼	,, 2¼ ,,
Karonga ...	443	7¼	,, 3¾ ,,
Kaporo ...	966	22½	Increase 9¼ ,,
Songwe N. N. ...	228	3	No change.
Songwe T. T. ...	109	2	Decrease ⅞ ton.
	1852	35¾ tons.	

Though this is a slight decrease over the total tonnage issued in 1937 it shows a considerable increase over that taken by *dimba* cotton growers in the previous season.

Cotton Census.

	1937 Growers	1937 Gardens	1938 Growers	1938 Gardens
Ngorenge ...	946	1622	907	2507
Songwe N. N. ...	232	264	233	307
Karonga ...	509	659	522	706
Hara/Nyungwe ...	20	23	—	68
	1707	2568	1724	3588

Markets.

	No. 1	No. 2	No. 3	% No. 1	Seed Multiplication Ratio
Hara/Nyungwe	3,152	1,294	—	70.9 %	8.0
Karonga ...	65,423	7,492	1,235	88.2 %	4.1
Kaporo ...	593,324	10,980	—	98.2 %	12.0
Songwe N. N.	13,523	4,237	—	75.9 %	2.8
Songwe T. T.	9,777	3,939	—	71.3 %	2.8

The average price paid for No. 1, No. 2, and No. 3 respectively was .795, .519, pence per lb. and .194, being approximately 2 points over auction price.

The average yield per acre was 453 lb., while the average yield per grower was 406. lb., and the average return per grower was 26/7d.

Marketing Conditions.

At Karonga marketing conditions were satisfactory but at Kaporo they fell far short of this. Buying began during the last week of November and continued in to January. A change of transport was effected this year in that the buying principal chartered a tug and barges from the Nyasaland Railways and he ran them night and day for the duration of the marketing season. As there was still no storage accommodation at Kaporo a market was held every time the tug arrived, only sufficient being bought (about twenty tons) to give it a full load. In this way, markets could only be arranged at short notice and only a limited amount of cotton could be dealt with each time. This involved an unnecessary amount of work for the Agricultural Supervisor at a time when he could have been very profitably engaged elsewhere in the field; with the break of the rains towards the end of December planting operations were in full swing at the Experimental Station and district demonstration plots, where close supervision is essential. In addition, considerable inconvenience was caused to native growers and any decrease of tonnage next year may well be traced to this. Some form of storage accommodation is essential at Kaporo if the industry is to develop normally.

Uprooting.

The cotton uprooting date was gazetted as December 31st, there being the usual argument as to its suitability on the plea that cotton might still be left in gardens and that growers would suffer thereby.

In Ngerenge, the main late-planted cotton area, cotton is followed by rice and any delay in the uprooting of the cotton causes a delay in the planting of the rice crop, with a consequent delay in harvesting. This again delays the planting of the succeeding cotton crop, with the immediate resultant danger that it may not be sufficiently well established before the supply of sub-soil moisture falls to a low level. A further danger, not so obvious, but equally important, is a consequent delay in picking, which is already late enough, with the chance that much cotton may be spoiled in the fields by rain or damaged at markets or in transit. It can be agrued that the close season is adequate enough and that any undue strictness in enforcing the uprooting rules may have an adverse effect on cotton production in the ensuing year, but on the other hand, this tendency to latenesss is cumulative and is to be strongly deprecated. No trouble was experienced with uprooting this season, but it was found necessary to allow the Songwe growers a little latitude.

COFFEE.

The small native coffee industry in the Henga Valley was slowly becoming moribund from lack of supervision and consequent lack of enthusiasm on the part of the growers, accelerated by the low prices received during the last year or two. However, during the year under review, native growers have attended regular meetings at the coffee demonstration plots at Nchena-chena and have shown very considerable interest in the various trials in progress; in particular, the beneficial effects of a deep mulch of useless vegetable wastes have been outstanding in the prevention of die-back and the maintenance of fertility. Over half the growers have now mulched their coffee gardens and a marked improvement for the better is already noticeable in quite a number of them. Yields on the whole were not high though it is expected that when effectively mulched gardens come in to full bearing in 1939, they will be satisfactory, and it is hoped that the manurial effect of the rotting mulches will eliminate dieback. In all there are 73 growers, though not more than half of them have good gardens, the rest having been planted in unsuitable sites or having been neglected.

Mr. Bingham, the Co-operative Officer, visited the district in October and as a result of his efforts, the Nchena-chena Co-operative Coffee Producers Society came into being with 24 members and properly elected president, secretary, and committee, drawn one each from the areas of Msokoto, Nchena-chena, Junju and Livingstonia. Local markets were explored and it was found possible to pay a price of 4d per pound for clean bean to the individual members, almost double the price for the previous year or two. Very considerable enthusiasm was shown for the Society and this, probably more than any other reason, should cause coffee to expand in the Henga Valley, though it must be realised by now that it will never be the goldmine that it seems the people were led to believe when it was first planted. It is also now realised by the majority of growers that the small garden, carefully tended, is far more profitable than a large one improperly cared for.

The native coffee industry in the Misuku Hills produced just over one ton of clean coffee from 137 growers, but lack of supervision militates against development. It is hoped to rectify this in due course.

European coffee in the Henga Valley is in a sorry state and yields are small and unprofitable, and it is not too much to say that, unless methods of production are drastically altered very soon and the tenets of "good husbandry" accepted, it will die out within a few years. As it stands at present it gives a poor demonstration to native coffee growers. European coffee in the Misuku Hills has almost died out and will shortly disappear.

WHEAT.

A small amount of wheat is grown in the Henga Valley and appears to be on the increase. Small trials of different varieties are in progress at Nchena-chena.

BEANS.

A quantity of native beans (*Phaseolus* spp.) from the Misuku Hills were bought by Government at Kaporo and shipped downcountry.

RICE.

The bulk of the Lake shore rice crop from Karonga northwards is carried over to Tanganyika Territory, where it finds a ready sale at enhanced prices, though a small amount is bought in by Government at Karonga in discharge of fiscal liabilities. An increase of production in the Hara and Deep Bay area has occurred within the last year or two and is liable to continue in view of the expected fall in the level of the Lake.

5. Experimental.

North Nyasa Experimental Station.

No experimental work was attempted during the season under review but demonstrational work went on as usual. Four five-acre fields were planted up to groundnuts for the purposes of seed multiplication, of the varieties Spanish Bunch, Japanese Bunch, Gambia and local, yielding on the average just over 1000 lb. of nuts in shell per acre. Five acres were under simply selected maize seed for maintenance of stocks, but only yielded about half a ton per acre on the cob, probably due to the drought in February. Further small plots were under various bean varieties and selections of finger millet, which averaged nearly a thousand pounds of grain per acre.

Towards the end of the year a small-holder was started, being alloted ten acres of land and a house and outbuildings; he was to put two acres under maize, half an acre to cassava, half to finger millet, a quarter acre each to beans and sweet potatoes, and he has land available for an orchard, bananas, timber, etc. Fertility is to be maintained by means of pigeon pea fallows and it is proposed that later he brings in stock and makes a form of rain-watered compost. He is to receive a monthly remuneration of 4/- until his maize is harvested, and after that a retainer of 2/- per month. His cash-crops are maize and groundnuts but cotton is not recommended, as raingrown cotton no longer complies with local rules, and though rotations have been worked out for a four year period, it may well be necessary to make alterations as time goes on.

The buildings erected with funds obtained from the Colonial Development Fund were completed during the year and there is now an office with clerk's room, a large two-roomed store with cement floor, a cart and implement shed, and a large cattle-shed with calving pens and a bull pen, in addition to staff quarters. Funds were also available from the Colonial Development Fund for purchase of cattle, and a bull, heifers, and oxen were purchased.

Kasisi Plots. Rice was planted on the Kasisi plots as usual, but it was found impossible to follow it with cotton on account of the failure of the Kasisi Stream to flood. As this was the second year that this had happened, it was decided to move the plots to a site approximating more nearly to that under which the bulk of the Ngerenge rice and cotton crops are grown.

Hara Plots. A small plot was laid down on the Hara, in the Deep Bay area, for the purpose of trying out and demonstrating the technique of rice planting followed by late-grown cotton. It was too late in the year to plant rice, but cotton was planted as soon as the land was dry enough, employing two times of planting at an interval of a fortnight. The yield of cotton, however, was most disappointing and the percentage of boll-worm damage very high and it would appear that the soil, a heavy black *makandi* clay, dries out too quickly when the sub-soil moisture falls and the cotton plants, though well established, fail to make normal growth. Under the circumstances it is proposed to restrict the issue of cotton seed and continue with the plots until further data is obtained. Another small plot on a different type of soil is also to be opened up in that area.

Nchena-chena Coffee Plots. The coffee plots at Nchena-chena, of which about two acres are now in full bearing, gave a yield of approximately half a ton of clean bean, despite the fact that some of the control plots yielded poorly. Each small plot is one-tenth of an acre and the four which were heavily mulched with a covering of dead grass, leaves, etc., yielded on an average 505 lb. of cherry per plot, as against the average of 259 lb. per plot of the other twelve plots. In addition, the mulched plots had no die-back at all and looked far healthier than plots under different treatments. The treatment next in value was that of a cover-crop of buckwheat, cut down in swathes when ripe and left to reseed itself. At the height of the dry season it was noticeable that the topsoil on the mulched plots was cool, moist and friable and no setback was given to the feeding-roots just beneath the surface. Native coffee growers visited the plots regularly and talks were given on all aspects of coffee culture and the process of hand pulping and processing of ripe cherry was explained; as, for the first time, a part of the yields were processed at Nchena-chena instead of sending all the cherry to Khowe Estate, they were able to get first-hand information. Demonstrations were undertaken with the use of artificial shade on old and young coffee and on the effect of totally and partially removing the crop on bushes in bearing for the first time, with the object of preventing die-back from overbearing. The latter demonstration showed up extremely well at one time and was much appreciated by a meeting of native growers.

Adequate soil conservation measures are taken and the system of box-ridging in the coffee rows has continued to be most successful and little, if any, wash has occurred, despite some heavy falls of rain.

An acre and a half of tung-oil was planted up early in the year with alternate trees of *Aleurites fordii* and *A. montana*, and it appears that the former on the whole has made the better growth. Interplanting with soya bean and other legumes was carried out for seed multiplication purposes.

Small trials of maize, with ridges across the slope of the land, wheat varieties, oats, koti-koti, finger millet selections, groundnut varieties, and buckwheat, were also grown, in the main for purposes of observation and demonstration.

Nkamanga and Hewe Plots. Small demonstration plots, each of two acres, were opened up during the year at Nkamanga and the Hewe not far from the headquarters of the two Native Authorities. In each case model homesteads have been built with efficient sanitation, grain-bins, etc., the one at Nkamanga being of rammed clay on account of the shortage of poles. The capitaos are being required to carry out suitable propaganda in the nearby villages, on the lines of Jeanes community workers. The two capitaos received three months training at Nchena-chena prior to taking up their duties on the opening up of the plots. At Nkamanga plots have been put down to *Faya* and a number of hill rices in the hope of working up a small rice industry in the future on the banks of the Runyina, and to maize, finger millets, groundnuts, beans, and similar crops, the aim being to demonstrate better methods of planting, of seed selection and storage, etc. Similarly at the Hewe Plots, though in this case no rice has been tried.

Misuku Hills Plots. A visit to the Misuku Hills was undertaken in company with the District Commissioner and Forest Officer, Dedza, to look into the matter of Forest Reserves and to make recommendations for betterment of conditions generally. A scheme was put forward but, in the meantime, it was decided to make a start with the limited means at hand; to that end, the senior Native Agricultural Instructor at Karonga was given a course of instruction at Nchena-chena in general methods of soil conservation and maintainance of fertility and was taught the technique of road-tracer work. He was then transferred to the Misuku to make a start with suitable propaganda and to open up a small demonstration plot where he could put his teaching into practice. He was also to work in close conjunction with the Native Forester in regard to the matter of stream bank preservation and reafforestation.

6. Native Authority Central Fund.

Funds from this source were not forthcoming until so late in the year that work on bee-keeping and the better preparation of beeswax had to be postponed for a year, but it was possible to open up a small demonstration of mixed farming and the manufacture and application of compost and its relation to agriculture. A capitao had previously been in training at Nchena-chena for some months. Cattle were purchased and the necessary buildings erected, with houses of rammed clay for the capitao, compost worker and herd-boy, with an office and a covered kraal and calf pen, and a small garden was taken over, contour-drained and stumped, and prepared for planting. It was then too late to apply compost to the maize plots, but it is proposed to apply it to finger millet, which is planted much later in the season, by which time the first lots of compost should be ready.

7. General.

(*a*) A curious practice is observed in the Henga Valley in the cultivation of the swampy valleys between the numerous small hills. These *vyungu* (Chitumbuka) are covered with tall grasses and reeds, which are cut down in September, dried off and burnt, drains are cut, which later become permanent, and the land hoed; maize is then sown in October and is harvested in late January or early February, when the *vyungu* are allowed to go back to their natural state till the next season. This early maize is not affected by stem-borer, as is maize grown early on normal soils and irrigated, the reason advanced by the natives being that the stem-borer cannot live in the very wet soils of the *vyungu*.

(*b*) A visit was made to West Nyasa during the year with the main object of making collection of cassava varieties, the following being found:—Thipura, Chingweyu, Kamulusu, Munyakayuni, Kwete (white and red), Kabinyu, Chidambo, Chipeta, Bitasumani, Thawathawa, Theghama, Chimpunobii, Mulongoti, Muzyoka, Loyisi, Ndazizwa, Kamayuni. The following were found near Mzimba:—Thipura, Bwetanyina, Njarambwani, while at Nchena-chena the following were found:—Thipura, Muwerewere, Bitasumani, Sulu, Kapanthe. Samples of all these have been sent to the Agricultural Officer, Mlanje, for use in connection with his studies on mosaic disease, while further samples have been planted out at the North Nyasa Experimental Station, together with other varieties from elsewhere.

(*c*) A visit was made to the Chimaliro Forest Reserve, Kasungu, in company with the District Commissioner and the Forest Officer, Dedza, to inquire into complaints by natives that their garden land was exhausted and that they desired to cut gardens in certain places in the Reserve. It was found that in one or two cases there was a certain amount of hardship and that the people were being compelled to cultivate steep and uneconomic slopes on hills outside the Reserve that should properly be protected; accordingly, after a survey of the ground, it was decided to recommend that their complaints be upheld. It was found that certain other villages could make out no adequate case and that they were suffering no undue hardship. It was noticed that the boundaries of the Reserve as gazetted were ill-defined and inaccurate and were, in places, at complete variance with local opinion.

(*d*) For the first time in the records of the district a small agricultural show was held at Nchena-chena on the King's Birthday with funds kindly provided by the District Commissioner, who attended and opened the show. A number of Europeans came and a large crowd of natives, who appeared to take a great interest in the proceedings. There were over a thousand entries in the produce and handicraft classes and the various demonstrations were well attended; these included one from the Medical Officer, Livingstonia, an exhibit by the Native Forester, and exhibit of ghee from the Zombwe Stock Farm, and others by Instructors of the Agricultural Department.

(*e*) Contact has been made with Jeanes Community Workers at Karonga, Mbelwa's and Kasungu, but it was noticed that they return from their training course too late in the year to enable them both to build a suitable homestead and to open up their garden and to take suitable measures of soil conservation, etc., such as are required if their holdings are to be an example to others.

B. G. CHARLES,
Agricultural Officer.

Zomba Experimental Station.

Staff. Mr. L. N. Raynor was in charge of the Zomba Experimental Station from August 10, 1937 to February 28, 1938 when Mr. A. B. Cormack, now officer in charge, returned from leave. Mr. Raynor was therefore entirely responsible for the field work and the large building programme.

The station is now adequately provided with arrangements for minimising soil washing.

Weather conditions. The rainfall total for the season was 65.82 inches, this amount being 17.95 inches more than the previous season and 14.87 inches above the average. Climatic conditions proved satisfactory during the seed bed period but with a dry December stands of most crops were poor, resulting in a large number of supplies being necessary and thus causing unevenness of growth. During January heavy falls were experienced and 10.44 inches were recorded between the 2nd and 7th, and in all 22.24 inches were registered during the month. This excessive rainfall was detrimental to growth and tobacco was side dressed with sulphate of ammonia after the heavy rainfall of the period 2nd—7th January. The area treated indicated very well the benefits of side dressings after heavy rain such as over 9 inches in fourteen days. As a result of this fertilizing the area produced some exceptionally good seed. February conditions were normal but it was then too late after the set-back of certain crops and with over 12 inches in March the season was far from being favourable.

The rainfall records are ;—

		Number of days on which rain fell	Total RAINFALL	Deviation from 10 YEARS MEAN
1937.	November	6	4.68	+ .43
	December	15	8.99	—1.02
1938.	January	23	23.45	+10.05
	February	10	10.30	+ .78
	March	22	12.68	+ 4.12
	April	11	3.37	+ .41
	May	4	1.12	+ .67
	June	9	.56	+ .09
	July	—	—	— .28
	August	5	.25	— .06
	September	1	R	— .15
	October	4	.42	— .17
	Total	110	65.82	14.86

Soil Conservation. The Nichols system of ridge terracing was well tried out with the excessive rain which fell during the month of January and it is pleasing to record that there were no breaks in any form. Actually the Nichols terraces have been modified to suit local conditions and are superior to the broad-base Mangum ridge terrace under the soil conditions and average slope of the Zomba station. The terrace has the advantage of having a small channel on the upper side which enables water to flow slowly away thus preventing water logging which is so detrimental to good growth of many crops. In the case of the Mangum terrace with the shallow broad depression serious water-logging is often caused.

It is often necessary with such crops as tobacco grown on ridges to have a gradient so that during heavy rains there can be no fear of water-logging during critical periods of growth. Such excess water in the soil has a far-reaching effect on yield and quality.

The lines of the tobacco ridges then make an angle with the Nichols ridge terraces. During heavy rains the water flows into the channel and is gradually led away and the tobacco plants as a whole do not become water-logged.

The system moreover is assisted by numerous silt pits in the channel itself situated mostly near the outlets which are usually stone-faced.

General line of work on various crops. During the past few years great attention has been devoted to the experimental work which would assist the native cultivator to improve his food and economic crops by means of rain-watered compost, rotations and ridge terracing but the Zomba Station has also in mind the improvement of diet by means of suitable crops and there has been constant progress. It has long been known that the diet of the ordinary native in the village is deficient in certain food factors and accessories and to improve this matter, large quantities of food crops with known high protein content are being rapidly bulked up in readiness for distribution.

Dr. Platt, Director of the Nutrition Survey, was particularly interested in the wide range of food crops grown and valuable information was obtained from him on the feeding value of crops suitable for improving the variety and deficiency in the diet of the average native. The crops selected are being rapidly multiplied and it is hoped that when the final report of the Nutrition Survey is made public the Zomba Station will be in a position to supply bulk quantities of various food crops.

The interest shown in these food crops proves that the aim and object of this station has been developed on the correct lines and that the importance of producing seed of economic crops should run concurrently with that of producing seed of crops suitable for a balanced diet.

It may be realised that the soya bean as the staple food crop of millions in the Orient is one of the most nutritious crops and again Dr. Platt was able to give detailed advice in regard to milling and preparation for food.

A mill was constructed of simple design and will be easy for any intelligent native to construct. It is essential to note that in China the whole bean is hardly ever used but the basis of all nutritious recipes is the crushed soya bean meal and stone mills are essential before propaganda regarding this bean is advocated.

Groundnuts. Numerous varieties were under trial but weather conditions were not suitable as the late March rains made harvesting difficult. It is proposed that all groundnut variety trials should be made at the Makwapala Station where conditions are more suited to this crop.

Pigeon pea. Evidence is at last conclusive that this important food and fallow crop is being taken up in greater amount by cultivators in various parts of the Southern Province and judging by the seed issues there will be an appreciable increase in acreage under this crop.

There is no other rotation crop more suited to the native method of cultivation if the land is prepared and ridged at 3 feet intervals and seed planted on the ridge at 18 inches apart, no intensive cultivation is necessary beyond that of keeping down weed growth until the crop is established. At this spacing a dense canopy will be formed which will successfully keep down all weed growth.

During the two year fallow there is an appreciable amount of leaf fall and on uprooting an exceptionally fine soil tilth is obtained.

The advantages of this crop are that the deep rooting system breaks up the hard-pan formed by continual digging and on decay allows free penetration of air. Roots have been traced to a depth of over 6 feet on the Zomba Station. The plants are resistant to both drought and excessive rainfall conditions.

When picked in the green state the beans are popular and well liked by all natives. They often supply during the time of harvesting the only green vegetable matter and are valuable for the supply of vitamin C. The dried seeds are also valuable.

The selected variety of Pigeon Pea has given yields of 800 lbs. of cleaned seed to the acre. It is an excellent crop for cattle and can be grazed off or fed as required.

At the higher altitudes the crop can be ratooned and a large quantity of bulky material is available for tobacco seed bed burning and for fuel. In the drier areas it is not advised to ratoon the crop but it should be allowed to 'stand over' and uprooted on completion of the fallow period

Soil improvement crops. Sunnhemp, var. Somerset. As previously mentioned difficulty was and is experienced in getting native cultivators to dig in a crop of green manure. Results strongly indicate that even by burning off a crop of sunnhemp an appreciable increase in yield of maize is obtained. With such data available there is more chance of success in getting cultivators to grow a small acreage under such a crop.

The variety Somerset Sunnhemp has been proved a good soil improvement crop with a high yield of seed on the Zomba Experimental Station. The advantages of this crop are that apart from the initial preparation only one hoeing is necessary in the early stages to establish it. Thereafter it will control all weed growth. The manure crop is greatly valued and mention will be made of a few of the various uses.

For buildings the mature sunnhemp makes an excellent under-thatch if tied in small bundles of 1½-2 inches in diameter and placed close together and securely tied with string. It is claimed that a much neater appearance is given to the under surface of the roof and bundles so tied have remained in perfect condition for over seven years.

Sunnhemp can be considered the best utility crop that can be grown on impoverished soils in areas where brushwood and fibre are not plentiful. The crop can be used in operations for nursery work; the bulky material once it has been cut provides a large quantity of material in a confined area for brushwood for burning nurseries, the native grower of tobacco being usually reluctant to collect adequate quantities of material which must be carried for some considerable distance.

If the seed pods from the sunnhemp are removed excellent nursery shades may be made with correct spacing to give the maximum amount of light and shade. Sunnhemp shades are easily and quickly made as it is not necessary to clean the sunnhemp as in the case of sekera or other grasses. Sunnhemp fibre may be used in the tying, making, and supporting of shades. Such use of sunn-hemp will reduce the damage done to many trees in the taking of fibre from the bark. (Such as *Brachystegia longifolia*).

The sunnhemp fibre mentioned above is easily obtained by retting the fibre in water for 24 hours and is removed by breaking the plant at the thickest part and pulling the fibre which easily peels off.

No difficulty is experienced in obtaining seed as yields of the improved Somerset variety reach as high as 1000 lb. of cleaned seed per acre.

Economic crops. Tobacco. Despite the excessively wet conditions a small harvest of disease-free Narrow Leaf Western has been obtained and a number of single plant selections were selfed It was far from a good seed year and it became necessary to draw on the reserve of seed stocks which is carried in case of failure, to supply the Southern Province seed requirements for native growers. Mention must be made of the suitability of the Western variety to produce by selection a type of leaf suitable for the specialised West African Market and that this has been done is proved by certain cured grades producing over 60% of leaf suitable for this trade. Continued efforts are being made by selection and topping to produce the ideal leaf as the Western variety is disease resistant and its suitability for native cultivation is well known.

On account of an anticipated water shortage due to diversion of the Mlungusi Stream a new nursery site was opened near the Likangala stream some 2½ miles away from the station. This was eventually proved to be correct as due to the water shortage in the Zomba Township the irrigation furrow from which water for seed-beds is taken was completely dry for several months during the nursery period.

A large number of plants were produced at this nursery and on completion of planting up of all fields on the station a big surplus of well grown plants was available for growers in the surrounding area.

Tung Nut. Aleurites montana. The large increase in acreage showed the importance of a possible major economic crop to the country and visitors from many parts of Nyasaland and elsewhere were interested in the plantation on this station.

3,166 lbs. of *A. montana* seed was harvested and every order placed with the Department was fully supplied.

274 lbs. of *A. montana* and 848½ lbs. of *A. Fordii* were received from the Forestry Department, the former being disposed of but there was little demand for the latter type. It is now recognised that vegetative propagation is the only road to success to produce high yielding trees and tests with various methods of budding have been undertaken.

The following methods of vegetative propagation have been experimented with :—

Chip Budding
Modified Forkert
Shield Budding

Results to date have not been satisfactory but by conducting a series of time of budding trials it is hoped that this will give some indication of the best method and also the period in which a large percentage of the buds will take. Advice has been obtained and it is definite that the stocks were rather on the small side but this point will be shown up as budding will take place at various intervals during the year.

The continuation of individual tree records gives the following results for the 1937-1938 crop, planted 31.12.31.

Height	18 feet
Spread	18 feet
Circumference 12 inches above ground level	22.8 inches
Yield (dried fruits per tree.)	23.65 lbs.
Sex of inflorescence :	
Trees with female blossom only	46.72 %
,, ,, male ,, ,,	23.77 %
Monoecious	29.50 %

Yield results of individual tree yields are given in the following table.

.81%	yield over 90 lbs. of air dried fruit
.81%	,, ,, 70 ,, ,, ,, ,, ,,
7.31%	,, ,, 60 ,, ,, ,, ,, ,,
7.32%	,, ,, 50 ,, ,, ,, ,, ,,
10.57%	,, ,, 40 ,, ,, ,, ,, ,,
9.76%	,, ,, 30 ,, ,, ,, ,, ,,
16.27%	,, ,, 20 ,, ,, ,, ,, ,,
5.69%	,, ,, 10 ,, ,, ,, ,, ,,
41.47%	,, under 10 ,, ,, ,, ,, ,,

(Records are also taken of 75 trees from the mother tree M 13—these trees are now 3 years old).

Average Height	11 feet	$4\frac{3}{4}$ inches
,, Spread	7 feet	7 inches
Circmference	9 inches	,,
Inflorescence :		
Male blossom	24.00%	
Female	56.00%	
Monoescious	10.66%	
No blossom	9.34%	

Seed issues. The importance of issuing reliable seed to native cultivators is fully realised and efforts are made by free issue (in limited quantities) of the particular variety suitable for the district. That these varieties have been found suitable is established by the number of repeated requests from year to year. Thousands of banana suckers of selected varieties have been issued, as also various varieties of sugar cane. There have in past years been numerous requests for seed and seedlings of *A. montana* from native growers, but these are likely to be refused in future. It has been observed from the recent experimental issues of tung seedlings that the native grower wishes for immediate results and if these are not speedily forthcoming the crop is neglected.

The total quantity of Western tobacco seed was 8,160 ozs. which was issued to supervisors in the Southern Province under the two strains Zomba Narrow Leaf as being suitable for the West African trade and Broad Leaf for the United Kingdom trade.

The cleaning, disinfection, and germination tests with this large quantity takes up a considerable amount of the junior officers' time but, even with the known resistance to disease of the Western variety, disinfection of seed for seed-borne diseases is of prime importance and this was clearly seen by the absence of disease in the cured leaf seen at all markets. Germination tests are systematically carried out and any seed showing poor germination is immediately discarded. There has been a large demand for Zomba Narrow Leaf in all districts. In certain areas over 60 per cent. of the leaf was quite suitable for the West African trade.

27,832 lbs. of miscellaneous seed were harvested during the season being an average yield of $4\frac{1}{2}$ cwt. per acre.

Cattle. The herd which is being improved was maintained in satisfactory condition during the year. Seven calves were born, three being heifer calves.

There were no deaths during the year but as young oxen from the herd were trained all old beasts wese disposed of. The feeding of concentrates, succulent feeds, and rotation grazing assisted the herd and the general condition was satisfactory.

Lick bricks from a formula received from the Acting Chief Veterinary Officer were well liked and possibly supplied the necessary minerals for healthy growth and condition.

It was observed that cattle on free range were more partial to the lick than those fed on concentrates. Composition of lick:—

300 lbs.	ant-heap clay
84 lbs.	lime
4 ozs.	Potassium
4 ozs.	Ferrous sulphate
2 ozs.	Copper sulphate
4 ozs.	Sulphur
60 lbs.	Salt

The above quantity was well mixed with water and put through a brick mould, air-dried evenly, and 77 bricks were obtained from this mixture.

It is not claimed that the mixture is ideal. Phosphates are lacking and also a greater portion of sulphur is most likely advisable.

The Zebu herd of cattle belonging to the Veterinary Department which were moved from the Makwapala station have been situated in the Forest Reserve, some few miles away from the main station. There have been six deaths during the year. The cause of death in most cases is unknown as postmortem shows no organic disease but severe anaemia was experienced in many cases. Mineral deficiency and in-breeding may be contributory causes.

Pasture Plots. The initial effort of the station to introduce and experiment with various pasture grasses has been continued and extended trials with various local grasses are being continued. Small plots on the station are planted with these various grasses and if suitable under tree growth, etc., they form the nucleus from which a larger area may be propagated in the actual grazing area in the Forest Reserve. The area fully planted up consists of 37 acres of the grasses as stated below.

Digitaria Penzii. Southern Rhodesia strain
Digitaria Penzii. South African strain
Panicum maximum
Pennisetum purpureum
Pennisetum clandestinum
Paspalum dilatatum
Paspalum Urvellei
Cynodon plectostachyum No. 1
Cynodon plectostachyum No. 2
Cynodon spp. *C. Dactylon*
Setaria spp. Reed Timothy
Setaria spp.
Hæmarthria fasiculata

Chloris gayana—Rhodes grass, has been severely damaged by baboons, of which there are large numbers in the neighbourhood and trials will not be continued. The Hunyani strain of Rhodes grass has not made satisfactory growth and is being interplanted with Swamp Couch Grass.

Interest in the established pastures in the Forest Reserve and plots on the station has continued and visits have been numerous to both places. A large number of orders for many grasses have been supplied to dairy men, farmers and others.

Compost Manufacture. The manufacture of Indore compost continues and it is estimated that over 400 tons have been completed. Carts continue with the collection and clearing up of waste material in the Zomba Township and the new four wheeler cart assisted greatly in moving large quantities of material quickly and efficiently. The arrangement with the Health Superintendent whereby labourers cut the grass in the township and labourers from the station are responsible for the removal and stacking at the side of roads greatly assisted in reducing cost per ton of manufactured compost. In the past compost in small quantities has been issued gratis to native

cultivators in the vicinity, but a charge is now being made to these and to garden-owners. Keen gardeners in Zomba responded rapidly, a large tonnage was disposed of and it is hoped that fertility will be restored to some of the garden soils which are lacking in organic matter. That native growers were willing to pay for compost is creditable and fair demand took place for small quantities. It was certainly borne out that previous issues had greatly increased the crop of maize to which the compost had been applied and that the money spent was returned in the form of increased yields.

Plant Importations. The following were grown on the station under trial :—

(*a*) From Research station, Amani ;
Derris eliptica—cuttings which are growing well

(*b*) From Salisbury Experiment Station ;
Canadian Wonder Bean
Dolichos lab lab
Panicum makarikars
Digitaria Swazilandensis
Digitaria decumbens
Digitaria spp. variety *malmanilsoog*
Digitaria spp. *Waterval*

(*c*) From Department of Agriculture, Tanganyika ;
Kobers Sorghum
Barberton Groundnut

(*d*) From Department of Agriculture, Kenya ;
Durum maize

(*e*) From Department of Agriculture, South Africa ;
Turkish Tobacco seed var. Soulouk
Scilla maritima
From South Africa ;
Peruvian Yellow maize
Sahara Yellow maize

Buildings. 150,000 bricks were made and burnt and the following new buildings completed :

House for officer-in-charge of the Zomba Station and three boys' quarters.

Two cattle sheds each 24 feet by 33 feet.

Brick building 18 feet by 60 feet with corrugated iron roof and cement ceilings. This building contains two seed stores and a room with sink and outlets with water laid on for disinfection of tobacoo seed. Each of the store rooms can be converted into a fumigation chamber by means of a few small alterations and large quantities of bulk seed can be dealt with.

100 yds. of storm stone drains were completed. Due to pressure of work the compost factory which is to be 36 feet by 84 feet remains uncompleted but the foundations have been laid and finished to the ant-proof course. These will remain throughout the wet season and will allow cracks to be rectified before building commences.

All foundations in the new buildings were treated with sodium arsenite in solution and applied between the inner side the ant-proof course and three feet towards the centre of the room. This operation was completed immediately before the floors were cemented.

Miscellaneous. On Mr. Raynor's departure for the Chiradzulu district, Mr. A. Carr commenced as Assistant in March 1938 for a course of one years practical training. Apart from carrying out the routine work on the station he was appointed Pay Master at the Zomba Receiving Station and successfully carried out these duties until the closing of the market.

Extension work. The establishment of small holdings in the district which will serve as centres of demonstrating methods of correct terracing, the improvement and retention of fertility, compost manufacture, rotation cropping and better food crops to improve the dietary of the average native has been continued. Suitable areas have been found in the section of N. A. Mlumbe and one area consisting of approximately 20 acres belonging to N. A. Chikowi requires special mention. The area comprises many soil types and the crops grown are maize, cassava, groundnuts, and millets. In the wet season " dimba " land is planted to green crops of *Brassica juncea*, (vern. *Mpiru*) tomatoes, English potatoes, peas, beans and many other vegetables. Efforts at soil conservation by means of ridge terracing have been carried out. Although the land was in good

heart there was serious erosion due to the run off on the steep slopes of Ntonya mountain. Severe gullying had commenced and would, if neglected, become serious. One boundary of the area is alongside the main road leading direct to the court house of N. A. Chikowi and as some of these gulleys were forming across and over the road it is a visual demonstration to the numerous natives passing by. Two compost pits 30 feet by 14 feet by 12 feet for the manufacture of Indore compost have been dug and water from a small spring nearby, has been made to run in a channel between the two pits. Instructions have been given in the manufacture of compost.

Mr. A. B. Cormack was able to assist in the planning of the school garden belonging to the Church of Scotland Mission which is alongside the Experimental Station. A cropping programme was supplied as also numerous varieties of seeds and cassava cuttings. The garden is badly washed and ridge terracing will serve a useful demonstration as well as the application of compost which has already been issued.

Botanic Gardens and Plant Introduction Station. The usual routine operations of keeping the area clean and the collection of waste material for compost manufacture were carried out. Large quantities of shoots of sugar cane varieties were issued to native growers.

MAKWAPALA SUB-STATION.

Beyond the usual cropping programme during the year a considerable amount of time was spent in studying the problems connected with this station. A definite programme of work was decided upon in an attempt to restore fertility to the soil.

System of ridge terracing. There was proof that the ridge terraces were not working satisfactorily and it was found necessary to convert them into the Zomba combined contour drain and terrace which would allow storm water to flow gently away. This was speedily completed by means of the Martin Ditcher followed up by hand work to complete the terraces and the necessary silt pits at specified intervals. It was also essential to improve and lengthen the outlets which flow into a natural belt of timber as it was found that these outlets were not continued far enough and the water was flowing back into the next terrace and causing serious breaks. It was also imperative that fields whose direction of flow in the ridge terrace was towards the central building block should be realigned but funds and time did not permit of this work being carried out during the year.

Compost manufacture. Efforts were made to increase the tonnage of Indore compost and 150 tons were made and applied to fields under annual crops. The quality of compost made cannot as yet be considered ideal as the absence of a well mixed vegetable residue affected the final product.

Tobacco. Good crops of tobacco have been grown in the past. It was decided to grow a small experimental area as barns for curing and buildings for handling the crop are available. The crop although small was excellent and completely free of disease, and produced a small crop of Zomba Narrow Leaf.

The Executive Engineer of the Public Works Department paid a visit to the station to examine all buildings and the sum of £30 was allocated for repairs so that every building with the exception of the main living house was repaired and completely re-roofed and all tobacco buildings were put in readiness for handling the crop.

The bridge over the Matawale stream was seriously damaged by floods and had to be removed.

The writers have confidence in restoring the fertility of most of the soils at Makwapala by methods which can be easily carried out by native cultivators. Funds do not allow of expensive artificial fertilisers nor the application of large quantities of compost but by the basic principles of correct ridge terracing, compost manufacture, rotation cropping, and good preparation and cultivation of the soil, results will soon be evidenced by increased yields of all crops suited to this particular area.

Acknowledgments.

Thanks are due to the Director of Public Works and his technical staff, to the acting Chief Veterinary Officer and the Conservator of Forests for assistance.

A. J. W. Hornby.

A. B. Cormack.

QUANTITIES OF SEED PRODUCED ON AND ISSUED FROM THE ZOMBA EXPERIMENTAL STATION.

	lb.
Maize, Potchefstroom Pearl	3,880
„ Honduras Yellow	1,612
Pigeon pea Selected 2,191 lb. / Local 768 lb.	2,959
Sunn hemp	4,100
Velvet beans	3,220
Soya beans O-too-tan	2,194
„ „ Otoxi	100
„ „ Herman	1,210
„ „ Barberton Yellow	268
„ „ Biloxi	547
„ „ Yellow Mammoth	132
„ „ Yellow J.	82
„ „ Green J.	18
Coffee, Robusta	250
Tung Oil Seed (A. montana)	3,166
Pearl millet, Pennisetum tamale	39
„ „ „ Echinurus	28
„ „ „ pycnostachium	229
„ „ „ leonis	364
„ „ „ gambiense	50
* Oats, Kinvarra	130
„ Kherson	84
„ Sunrise	52
„ Hull-less 589	27
„ „ „ 132	31
* Wheat, Lalkassar wali	62
„ Pusa 1	53
„ Quality	22
„ Droop	24
„ Reward	10
Rye	31
Buckwheat	150
Millet, Italian white	85
„ Proso	31
Teff grass	125
Phaseolus lunatus varieties	65
Cow pea	15

NOTE. * Oat and Wheat varieties were grown on plots of equal size. Space did not allow of experiments with a proper lay-out.

Lilongwe Experimental Station. 1937-38.

I was away on leave from July 1937 to January 1938 and during my absence Mr. Burton was in charge of the station. Early in May I was seconded to a tobacco market and the Assistant Chemist, who came up to conduct a soil survey, relieved me. I returned to the station in July, but was again obliged to leave in September for one month for health reasons. During my temporary absence Mr. R. J. Sanderson was in charge. These interruptions interfered considerably with office routine. Acreage under cultivation :—

Likuni (main station)	...	105	acres
Chimvua (sub station)	...	43	,,
Total	...	148	

Weather conditions.

Planting rains were abundant toward the end of December and good stands were established with cotton, tobacco and groundnuts. Good planting conditions continued through January but the rather excessive rainfall and lack of sun checked growth of earlier planted crops. February was an excessively dry month with irregular rainfall distribution and early planted tobacco began to flower low. The setting of maize cobs was also adversely affected. The peculiarities of the season were well reflected in the final tobacco yields which were light, yet at one time the crop appeared outstanding in the field. Maize yields also were low. Seasonal rainfall (October—September) 36.8 inches. The mean seasonal rainfall for 9 years is 33.7 inches.

Crops.

The bulk crops, maize and tobacco, gave poorer yields than for many seasons past. The failure of the maize was due to planting of faulty seed and fields were not fully planted up till mid December. The very low Dark Nyasa tobacco yields are partly accounted for by the fact that some of the late January plantings were on poor soil and stands were very patchy and also that the best Western Dark Nyasa was kept for seed. The Bright varieties on the other hand (Cash and Hickory Pryor) maintained an average of 500 lbs. cured leaf per acre. This crop is grown on "nsanga" type soil at Chimvua and the plot has been under continuous tobacco since 1934. This year for the first time it was treated with 5 tons compost, 100 lb sulphate of ammonia, and half the plot was also treated with 100 lbs double superphosphate per acre. The part treated with the superphosphate actually yielded 650 lbs cured leaf per acre.

Just over 1,300 lb Western Dark Nyasa seed was harvested off 10 acres. Swamp rice and most bean crops gave higher yields this year than for some time past, but all yields are still much below what they should be. A small plot of Spanish bunch groundnuts proved better than Gambia and the local variety and seed has been kept for duplication. Of several strains of soya bean received from the Empire Cotton Growing Corporation experimental station at Domira Bay, 'AME' was selected as being the best for green manure and 'OI' as a possible substitute for O-too-tan.

It is unfortunate that as yet no suitable crop has been found to incorporate with the traditional native rotation of maize, tobacco and groundnuts. Those crops which have been found to be a success are ruled out from the native standpoint because, either they possess no economic or food value, or they entail too much labour. The only present possibilities seem to be cotton as a rotation and tung oil as a perennial crop. Four year old trees of the latter have started to bear on certain soils on this station and though growth is very much slower compared with areas with higher rainfall and less severe winter conditions, it has been shown that tung will bear in this district with its very long dry season and occasional light frost. One drawback is the length of time it takes for the seed to germinate—3 to 6 months is the time taken in the particular nurseries used and should the crop ever be recommended for this area, it would possibly be best to issue one year old seedlings.

The Empire Cotton Growing Corporation specialists are still endeavouring to find a strain of cotton suitable for local conditions and though returns so far are not comparable to those obtained from established cotton areas, the yield here has been improved considerably since experimental work started.

Soya bean is not a success. Yields have been low consistently and doves are a pest when the crop begins to germinate. It spite of propaganda it is not popular among natives as a food.

Station cattle.

The station herd now stands at 33 head. Seven calves were born during the year, one of which died due to digestive trouble. One cow and two bullocks were also lost. The death rate among calves shows a satisfactory reduction and this is probably due to regular treatment for worms and occasional dosing with 'Kerol'. The slow increase is due entirely to the prolonged absence of the home bull who has become a confirmed wanderer. He can be enticed back, but will not stay with the herd. He maintains his condition remarkably well under native conditions. The native herds round about the station are freely sprinkled with the Friesland strain.

Four bullocks have now been trained as work oxen and two more are being trained.

With the exception of the cows in milk and the work oxen the cattle were not fed until October, but they were allowed to forage on the crop wastes taken to the 'kola' for composting. From then, till the break of the rains, they were fed on a maize and soya bean mixture and given maize silage once a week. The cattle took very readily to the silage and it was difficult to keep them away from the pit on the days when it was opened up. The silage proving a success it is proposed to continue the practice.

Compost.

Compost was made throughout the year in pits situated near the cattle sheds following a modification of the Indore process. It was found that this method came out somewhat expensive, nor did it break down as well as expected. Water has to be carried from a nearby stream and labour costs were excessive. In the very dry conditions prevailing during the winter and spring months it was difficult to maintain an adequate moisture content and the coarseness of some of the resultant compost may possibly be attributed to this. No doubt too, that much may be accounted for by inexperience. It is observed that visual results obtained so far from this method of making compost appear superior to that of rain-watered compost, but it remains to be seen whether the final results justify the extra expense. It would certainly seem to be more economical to utilize the field stack, rain-watered method on those fields farthest away from the cattle sheds. This is far more likely to be the method adopted by the native cultivator.

Smallholders.

The two smallholders, one at each station, had a successful year financially. Both had good tobacco crops of 600 lbs odd cured leaf from one acre. The Chimvua man sold 600 lbs @ 2½ per lb. and the Likuni man 400 lbs odd @ 3d. The tobacco was marketed for them. Both had 4 acres under cultivation, the crops being maize, beans, groundnuts and sweet potatoes. The maize yields were below normal and it was found that one acre of maize was insufficient for a household comprising one man, one woman and one child. Each man has saved £2 towards the cost of a dwelling house which it is hoped to erect this year.

A lot remains to be done before the smallholders can be considered as models for the rest of the community. It is difficult to estimate what good, if any, they are doing, but the Likuni smallholder is well situated with regard to affording a visual demonstration to interested natives and he states that he was visited by several during the season.

It should have been mentioned earlier that field stacks of compost are made every year and compost applied to the tobacco land.

Any left over is put on the field.

General.

Soil survey. A soil survey was carried out at both stations by Dr. Black and contour maps made. Analyses of soil samples are being made at time of writing. It is hoped to discover why the red soils at Chimvua lose their fertility so rapidly.

Water supply. This was completed during the year. Both stations are equipped with 5,000 gallon capacity tanks and petrol engines for delivering supply.

Roads and buildings. Work on the above was mainly confined to upkeep.

Agricultural learners. Every year sees an increase in the number of natives who wish to join the staff as agricultural learners. As mentioned in my report last year it is beyond the scope of the officer in charge of this station to give these men a proper training and it is understood that the matter is receiving official attention. At present there are 13 learners employed on the two

stations. Nearly all the present learners are Mission educated natives. Most of them seem desirous of entering employement when they leave here. One boy was sent here by his father to learn for his own good. He should prove a valuable demonstrator in his own village.

Seed issues. Seed issues continue to remain negligible, only a few natives from the neighbourhood have come in for seed. Bambarra groundnuts and cowpeas seem the most popular demands. About 1 ton of velvet bean was disposed of to planters and a few pounds of soya. The Lilongwe Turf Club is the most consistent purchaser of maize and beans. One demand for soya was received from a Jeanes School teacher at Ncheu as the result of his visit to the Lilongwe Show.

District Work.

Seasonal notes. The seasonal notes 'Zokumbukira' were discontinued when I was seconded to a tobacco market and as yet have not been resumed. It is hoped to continue them again shortly.

Village demonstration plots. These plots which are scattered throughout the district are under the control of the tobacco Supervisors. Their aim and object is to afford the native a visual demonstration of the benefits of correct soil management as against their traditional methods of soil denudation. The plots are divided in half, one section of which is put under a three year rotation of maize, groundnuts and tobacco planted on ridges and the other is planted to continuous maize on mounds following the native practice. The rotation plot also receives a dressing of farm yard manure at the rate of 5 tons per acre when under maize and tobacco.

At the end of the third year a comparison is made between the two main crops. All plots completed the rotation cycle this year and the results were striking, the rotation plots yielding 130 per cent. more maize than the control. When both plots were harvested, heaps were made on their respective plots so that natives could see the difference in yields more plainly. Supervisors report interest displayed in varying degree. The Supervisor in the Natenje area reports that more natives are planting their maize on ridges as a result. The plots are to continue in operation.

Manuring. Many natives manured their tobacco gardens whole or in part last season, but found unfortunately that the No. 1 wrapper grade produced as a result was not in much demand. This has had a discouraging effect and it is feared that many will cease to manure. They contend that their pecuniary reward is not commensurate with the labour entailed and this is the crucial test for the average native. Only the cash crop is manured.

Compost stacks were again to be seen left lying for the elements to rot but without any assistance from the owner. Propaganda continues.

Ridge-terracing. The total acreage ridge-terraced by the field staff during the past year was 3,340 acres. Details as follows :—

Market area		Acreage
Nsaru	...	1,059
Lombadzi	...	480
Mponela	...	350
Matenje	...	1,451
	Total	3,340

This is a decrease of nearly 2,000 acres over the previous season and is due to the fact that capitaos were instructed to report only acreage actually ridge-terraced. In the past, acreage, 'laid off' was also included in the reports giving an erroneous impression, as many of the terraces

were never completed. In spite of the new system of recording, Supervisors report that the figures are to be regarded with suspicion, as owing to pressure of work on markets this year, they were unable to verify much of the work supposed to have been done. Established terraces are usually kept in good repair but the natives remain apathetic on the whole and little initiative is shown. They seem to appreciate the value of the terraces, but the amount of work involved is a deterrent.

Plans for 1939. A new 5 acre block is to be opened up at Chimvua on 'Nsanga' soil for flue cured experiments. No further extensions are contemplated.

I. The following experiments which have not yet completed their cycle and are duplicated at both stations gave negative results during the past season.

Experiment No. 2. Lasting effects soya dug in on maize.

,, No. 3. Soya as cover crop for tobacco.

A white soya variety trial which has been running for 4 years at Likuni has now been abandoned, as it has given a negative result every year.

II. The results of a manurial experiment on Dark fired tobacco at Chimvua is given below. 1st year of trial. Latin square. Plots 1/40 acre.

Plot	Crop	Treatment	Treatment total yield (green leaf)
A.	Tobacco		
	Western D.N.	Control ...	277 lbs
B.	do	+ 3 tons Compost ...	272 ,,
C.	do	+ 6 tons ,, ...	271 ,,
D.	do	3 tons ,, ... + 100 lb Double Superphosphate ...	317 ,,
E.	do	6 tons Compost ... + 100 lb Double Super. ...	306 ,,
F.	do	100 lbs Sulphate Ammonia ...	322 ,,
G.	do	100 Sulphate Ammonia 100 lbs Double Superphosphate	330 ,,

Analysis of Variance.

	Degrees of freedom		Sum square		Mean square
Treatment	6	...	551.35	...	91.89
Error	30	...	1116.46	...	37.21
					RATIO = 2.46

Z calculated = log.2.46 × 1.1513 = .4500

Z observed (P = .05) N1 = 6. N2 = 30. = .4420

Therefore treatment differences are significant.

Standard error = $\sqrt{37} \times \sqrt{7} = 16.11$

Test for significant differences = 3 × SE = 48.33.

Applying this test G. is better than A.B.C.

F ,, ,, ,, B.C.

A general examination seems to suggest a lack of nitrates in the soil and no lack of humus.

R. E. JACKSON.

Zombwe Stock Farm—Experimental Plots 1938.

General:—A number of plots were established on the farm during the season with three objects in view. Firstly, to provide practical demonstrations in improved methods of cultivation, erosion control, and the conservation and application of kraal manure; secondly, to endeavour to obtain some idea of the potentialities of the better valley sands under proper treatment and thirdly with an idea of producing a certain amount of seed for issue in the section.

Special attention was paid to maize, as the principal grain crop, although it was unfortunately impossible to obtain any improved seed. A most interesting and useful demonstration was also provided by the excellent results obtained by the planting of finger millet on soil that had received a moderate amount of compost in place of the customary heavy burning.

Soya and pigeon pea seed from the Zomba Experimental Station arrived too late to afford any data. A certain amount of seed will be obtained from the former, however, while the latter should come into bearing next season. Pigeon pea seed obtained from the Native Tobacco Board, Lilongwe, in early January has grown well and is now carrying a large amount of blossom. A plot of *Canna edulis* has also done well and roots should be available for distribution later in the season.

Rainfall: Distribution has been particularly favourable to grain crops, but, owing to its sudden and unusual stoppage in mid-April the later planted groundnuts have suffered badly. Figures for the season are as follows:—

October	1937 ...	.07″
November	,, ...	.05″
December	,, ...	4.39″
January	1938 ...	5.68″
February	,, ...	3.83″
March	,, ...	7.84″
April	,, ...	1.21″
	Total ...	23.07″

Maize: *Type of Seed*, Local. Tipped and butted but of poor quality.
Size of Plots: 200 sq. yards each.
Total number of Plots: 50
Plantings: (*a*) December 15th, 16th and 21st.
(*b*) January 1st, 14th-16th, 23rd-26th.
Compost Rates: (*a*) 4,800 lb. per acre.
(*b*) 9,600 lb. ,, ,,
(*c*) 14,400 lb. ,, ,,
Weights: All weights are for grain on the cob and with sheaths unremoved.

1. *Usual local type of surface cultivation (3″-4″) only.*
December Plantings:
93 lb. 2 Plots. Average yield per plot = 46.5 lb.
,, ,, per acre = 1,126.3 lb.
January Plantings:
109.5 lb. 2 Plots. Average yield per plot = 54.75 lb.
,, ,, per acre = 1,324.95 lb.

2. *Deep Hoe, no compost.*
December Plantings:
459.50 lb. 7 Plots. Average yield per plot = 65.64 lb.
,, ,, per acre = 1,588.5 lb.
January Plantings:
515.75 lb. 7 Plots. Average yield per plot = 73.68 lb.
,, ,, per acre = 1,783.06 lb.

3. *Deep Hoe plus Compost, rate (A).*

December Planting:

163 lb. 2 Plots. Average yield per plot = 81.5 lb.
,, ,, per acre = 1,972.30 lb.

January Plantings:

392 lb. 4 Plots. Average yield per plot = 98.0 lb.
,, ,, per acre = 2,371.60 lb.

4. *Deep Hoe plus Compost, rate (B).*

December Plantings:

247.75 lb. 3 Plots. Average yield per plot = 82.58 lb.
,, ,, per acre = 1,988.44 lb.

January Plantings:

1148 lb. 9 Plots. Average yield per plot = 127.56 lb.
,, ,, per acre = 3,086.95 lb.

5. *Deep Hoe, plus Compost, rate (C).*

December Plantings:

254.5 lb. 2 Plots. Average yield per plot = 127.25 lb.
,, ,, per acre = 3,079.45 lb.

January Plantings:

905.5 lb. 6 Plots. Average yield per plot = 150.9 lb.
,, ,, per acre = 3,651.78 lb.

6. *Ridge Planting plus Compost rate (A) December only.*

366.5 lb. 4 Plots. Average yield per plot = 91.6 lb.
,, ,, per acre = 2,216.72 lb.

7. *'Matutu' cultivation, no compost, and interplanted with Cow pea.*

December Plantings only:

Maize 95 lb.
Cow peas 53.5 lb.

2 Plots. Average yield per plot = 47.5 lb.
,, ,, per acre = 1,149.5 lb. } Maize

,, ,, per plot = 26.75 lb.
,, ,, per acre = 647.35 lb. } Cow pea

The most striking factor about the above figures is the general increase in yields of the January plantings over those plots planted in December, more especially as there was no prolonged dry period between the two. In fact rain fell every day from December 20th to 29th, while in January, a weeks, dry spell intervened between the first and second plantings. The difference in yields between the two periods is shown in the following table:—

	December yields A.		January yields B.		Increase of B. over A.	
	Plot	Acre	Plot	Area	Plot	Acre
1. Top cultivation ...	46.5	1125.3	54.75	1324.95	8.25	199.65
2. Deep Hoe	65.64	1588.5	73.68	1783.06	8.04	194.56
3. Compost A.	81.5	1972.3	98.	2371.6	16.5	399.3
4. Compost B.	82.58	1988.44	127.56	3086.95	44.98	1098.5
5. Compost C.	127.25	3079.45	150.9	3651.78	23.65	572.33
6. Ridge planting & Compost A. ...	91.6	2216.72	—	—	—	—
7. Matutu	47.5	1149.5	—	—	—	—

The greatest increase occurs in the plots treated with compost, rate B.—i.e. 9,600 lbs. per acre. Here the difference is just over 55, per cent. as against 18½ per cent. in those treated with compost, rate C., and 20¼ per cent. in those that were given the A. rate. Of the unmanured plots, those of group 1. show an increase of 18¾ per cent. and those of group 2. 12¼ per cent.

Apart from this difference in yields due to time of planting, the figures seem to prove that, with proper treatment, satisfactory returns can be obtained from these soils. Allowing 40 per cent. as an ample margin for weight of cobs and sheaths, the yields from January plantings of plots treated with compost, rate B, gave an average of 1,852 lbs. of grain per acre, while even the average of 970 lbs. obtained by deep hoeing alone shows a marked improvement over the 795 lbs. reaped from those cultivated in the local manner. Such a difference clearly shows that the annual food shortage in this area during normal years is mainly due to the methods of cultivation in vogue and can be greatly reduced, if not completely obviated, by adequate instruction.

In relation to the above data it must be noted that the site of these plots was previously occupied by a native gardens and that there was the usual dearth of humus and signs of general exhaustion common to this area. Last years figures for gardens taken over from natives show an average of 718 lb. of grain per acre which very well agrees with group 1 of the above plots. The difference between the two sets of figures—i.e. 77 lb. or an increase of $10\frac{3}{4}$ per cent.—would be due to the more favourable growing conditions experienced this season.

The small holder established on the Farm, who, although he had no compost, deep hoed his garden and planted it under supervision, obtained a yield of just under 1,000 lb of grain per acre. This approximates the figure for group 2.—i.e. 970 lb. per acre.

Groundnuts: *Type of seed*:—(*a*) Rhodesia seed.
(*b*) A second supply which was alleged to be Rhodesian seed but was of a very inferior quality and was probably a local type from the Native Tobacco Board, Lilongwe.

Size of plots:—200 sq. yards each.
Total number of plots:—12.
Plantings:—January 4th, 25th and 27th.
Weights:—All weights are for unshelled nuts.

1. *Planted on 'matutus,' January 4th.* (Type A seed)
397 lb. 4 plots. Average yield per plot = 99.25 lb.
,, ,, per acre = 2,401.85 lb.

2. *Planted on 'matutus.' January 25th* (Type B seed)
$55\frac{1}{4}$ lb. 4 plots. Average yield per plot = 13.81 lb.
,, ,, per acre = 334.2 lb.

3. *Flat planting (24″ × 6″), January 27th.* (Type B seed)
79 lb. 4 plots. Average yield per plot = 19.75 lb.
,, ,, per acre = 477.95 lb.

Even taking into account the fact that type, A, seed was exceptionally good, the yields from the first group of plots were highly satisfactory. As has already been noted, premature stoppage of rains had disastrous effects on the later plantings, and the only point to be remarked on with reference to the two latter groups is the, comparatively, larger yield of plots in group 3 under the adverse conditions.

Rosette infection was entirely absent in the plots of group. 1, but made an appearance in all the late planted plots.

No compost was applied to any of the plantings.

Millets: 1. *Foxtail.* Six plots of 200 square yards each were planted on dates ranging from January 10th to February 4th. One plot received an application of compost at the rate of 7,200 lb. per acre. Highest yields were obtained from plots planted on January 21st, while those planted on other dates gave approximate yields that were vastly inferior. The following table shows the results obtained. All weights are for grain on the head:—

TABLE II.

Date	Plot	Yield	Yield per Acre.
January 10th ...	1	9 lb.	217.8 lb.
,, 21st ...	2	20 lb.	484 lb.
,, 21st ...	(Compost) 2A.	35 lb.	847 lb.
,, 28th ...	3	9 lb.	217.8 lb.
,, 28th ...	3A	8 lb.	193.6 lb.
February 4th ...	4	8 lb.	193.6 lb.

2. *Finger millet.* Seven plots were planted on dates ranging from January 10th to February 24th. Two of these (Nos. 3 and 3A) received applications of compost at the rates of 9,600 and 3,600 lb. per acre respectively. Special late plantings were made, to coincide with the times chosen for planting by a considerable proportion of the local natives. The crops harvested from these were particularly poor. Results obtained, however, from mid-January plantings with the application of compost made a far better showing than the best gardens cultivated under the burning system. These plots were visited at all stages of growth, by the native farm committee and made a very definite impression.

Weights given are for grain on the head.

TABLE III.

Date	Plot	Yield	Yield per Acre.
January 10th ...	1	48 lb.	1,161.6 lb.
,, 15th ...	2	38.25 lb.	925.65 lb.
,, 18th ...	3 (Compost)	107 lb.	2,589.4 lb.
,, 18th ...	3A ,,	72.25 lb.	1,748.45 lb.
February 1st ...	4	36.75 lb.	889.34 lb.
,, 15th ...	5	23 lb.	556.6 lb.
,, 24th ...	6	13 lb.	314.6 lb.

Cowpea: Seven plots of cowpea were planted, one of which received compost at the rate of 9,600 lb. per acre. The latter ran entirely to foliage and formed a dense mat, producing very few flower spikes. The yields and planting dates are as follows:—

TABLE IV. (NOTE: Weights are for shelled peas).

Date	Plot	Yield	Yield per Acre.
December 16th ...	1	18.5 lb.	347.7 lb.
,, 16th ...	1A	26.75 lb.	647.35 lb.
,, 21st ...	2	12. lb.	290.4 lb.
January 15th ...	3	30. lb.	726. lb.
,, 18th ...	4 (Comp.)	9.5 lb.	229.9 lb.
February 1st ...	5	49. lb.	1,185.8 lb.
,, 1st ...	5A	33.5 lb.	810.7 lb.

Soya Beans: No information can be given about this crop owing to the late arrival of seed from Zomba and the poor quality of the O-too-tan seed that was available on the farm. The following quantities of seed are, however, available for further trial next season:—

O-too-tan	53 lb.
Barberton Yellow	9 lb.
Mid West	31 lb.
Herman	19 lb.
Hecarsland	21 lb.

Plots of cassava, sweet potatoes, *Canna edulis*, and pigeon pea are not yet ready for reaping.

A few sunflowers from the two plots grown for silage were allowed to mature for seed and a quantity is available.

J. E. L. FENNER,
22—6—38.

Nyasaland Cotton Experiment Station, Domira Bay Progress Report for the Season 1937-38. Cotton-breeding, and Field Experiments

By S. T. Hoyle.

Season.

The rainfall total for the season was 30.40 inches, which is very little below the average and the distribution was good. The rains came late at the end of December and, with the exception of a short break in February, continued fairly evenly until the middle of April, which is rather later than usual. The bollworm attack was much less severe than last year and also the stainers were less numerous than is usually the case. The combined effect of all these factors was that the effective growing and ripening period was longer than usual. The average yield for the Station, on which no manure of any kind is used, was 270 lbs. lint per acre, the highest average which has yet been recorded.

Variety trials.

Four variety trials were planted and with the good season which was experienced it was possible to make effective comparisons between the strains. Actually there is little change in the order of yield of the leading strains as compared with the results of the last two poor years, there are a few newcomers at the top of the list but the most useful result is that it is now possible to discard some of the lower yielding strains with some confidence.

The highest yield was given by H.K., a cross between U.4 and Cambodia and U.4 which was made by Harland and received here in 1933. This gave 470 lbs. lint per acre in a trial in which C.28, a standard U.4, was yielding 360 lbs. H.K. makes a very nice, compact but not close plant and has a very high ginning percentage. The lint feels rather coarse but the hair weight is about the normal for U.4 cottons. The next group, yielding about 400 lbs. lint, included N.10, C.4-2 and G.4-5. These two strains from Gatooma, which have not been in the first flight before, are tall, rather coarse types and later than most strains. The past season has favoured them more than recent years have done. Then there was a bunch of strains all yielding about 360 lbs. lint which icluded C.28, Z.14, 0101, G.4-14, C.5-79 and G.5-123. The last named has a normal ginning percentage but the others from Gatooma have a low one and owe their position here to their prolific cropping.

H.L. (U.4 x Gambia x U.4) and N.C. (the same cross as H.K. but made locally) yielded about 380 lbs. lint. The former has very mixed lint, much of it being shorter than U.4 and the ginning percentage is low. The hairweight is low and the maturity is high and if some of the selected plants with longer lint breed true to type this may be a valuable addition to the range of cottons on the station. Other crosses which have done well are U.4 x Meade x U.4 and U.4 x B.30-1 x U.4. H.K. is the only one of the crosses which has definitely yielded more than the best of the U.4's; the others are still mixed in habit and lint characters but the ones mentioned above show promise of producing some very high cropping strains.

Seed was taken from various Native Trust Land markets and grown on the station in a strain trial with two selected strains as a control. At the first picking when rather more than half the crop was harvested the two Station strains were significantly better than the others; there were no differences, however, in the total yields at the end of the experiment. As has been mentioned above the season favoured late maturing strains more than usual and it is possible, had the season closed down earlier, that the significant differences at the first picking might have been maintained. The selected strains were noticeably smaller, more compact and much more even in habit than the seed from Native Trust Land; also the ginning percentage was higher by 1-2%. The same experiment repeated on a private estate gave a similar result. All the surplus seed from the station is being bulked on a private estate next season and will later be issued to an isolated area of Native Trust for land further multiplication.

A cultivation trial in which no precultivation and ordinary digging were combined with ridge and flat cultivation gave no significant result. It is possible that there may be a cumulative effect after this experiment has been running for a few years.

Lilongwe

The season started off well and at one time it looked as if there would be a really good crop. Towards the end of April the plants began to go off and the finish was not as good as had been expected, although there were no frosts in June as is usually the case. This falling off was probably caused by a combination of bacterial disease and staining. Of the strains grown L.1 and L.33 were again the highest yielders, giving over 200 lbs. of lint per acre though a large proportion of this was badly stained. L.1 is a very good opener and looks much more attractive than L.33 which never really looked healthy though there was no difference in the final yields. L.11 is another good local selection which has a very high flowering rate but rather small bolls and a lower ginning percentage than either L.1 or L.33. The best of the Gatooma selections were G.5-21, G.2-26 and G.4-2 which all yielded about 150 lbs. of lint. A number of new selections were made and among these L.14 showed up well and some plants taken from G.5-79 are promising.

INVESTIGATIONS ON RED BOLLWORM

By B. L. Mitchell.

The pupal cages laid down by Parsons are running smoothly in all districts. It is too early yet to state whether the non-emerged pupae are diapausing or dead, but there appears to be little or no diapausing at Port Herald a certain amount at Chiromo and a considerable amount at Domira Bay and Balakas. Congestion in the trays due to diapausing pupae has necessitated an increase in the batteries of trays at the last three stations.

During the growing season the bollworm infestation was considerable less than last year, probably due to the more rigid enforcement of the two months close season. A considerable amount of damage was, however, done to the crop. The writer arrived from Barberton in August and so did not see the crop in the field at Domira Bay.

Larvae were scarce at Domira Bay and Balakas in September but were plentiful at Chiromo and Port Herald. Another trip was made down the Lower River in October and green bolls and larvae were absent except on the marsh land where both were plentiful.

A randomised block experiment for cutting out dates has been started at Domira Bay and is proving useful in training new staff in field routine.

An experiment has been started at Port Herald and Domira Bay to determine the length of life oviposition and fertility of the moths, especially during the close season.

There has been little emergence of moths at any station during October, and it is believed that the dry heat is responsible. Down in the Lower River most of the larvae die as soon as they are put in the cages but a larger number pupate if they are entered in the evening. One tray at each station has been given a grass shade.

ROTATION CROPS

By W. L. Miller

The maize crop has done well averaging over 3,000 lbs. per acre. The selected native maize was tried again against Potchefstroom Pearl which last year was significantly better than the native. The experiment was not significant, though both strains gave higher yields per acre, the native showing an improvement of 550 lbs. per acre at 2,900 lbs, and the Potchefstroom Pearl improved by 340 lbs. at 3,240 lbs. grain per acre.

The maize time of planting result has reversed previous trials in that the first planting was worse than some of the later ones. This is probably due to the fact that the first planting was, in effect, 'dry planting', though this was not intended. Rain appeared to be imminent but none fell for about a fortnight after planting. The highest yield was 3,660 lbs. grain per acre January 6th planting, which declined to 1,450 lbs. for the January 26th planting.

Farm compost, at 4 and 8 tons per acre, was tried against wood ash at 1,000 lbs. and control. The ash treatment was significantly worse than the compost and control, and the 8 ton application significantly better than any other. There was no significance in the maize spacing trial, though the spacings at 3 feet, 2 and 3 plants per hole, gave the highest yields. A mass selected bulk of native maize outyielded a mass selected bulk of Potchefstroom Pearl by 665 lbs. grain per acre.

The groundnut crop was affected by dry weather in February. Yields were down from an average of a ton of unshelled nuts per acre last season to 1,300 lbs, which is nearer, but below, the normal average. There has been a keen demand for seed for export and local consumption. Adjacent lands have been taken into the station, increasing the area under cultivation by about 26½ acres. This new clearing will enable a groundnuts break to be included in the main rotation next year. Single plant selections are being carried on with Virginia, Gambia and Barberton bunch, and several new introductions have been made.

Sorghums did well. Several short term dwarf varieties from Swaziland are very promising, though more susceptible to weevil damage than the long term native varieties,

Sesamum was grown for the first time at the Station. A ¾ acre block yielded over 600 lbs. of good white seed, most of which has been disposed of to the Department of Agriculture for issuing to natives for seed.

Nine strains of Soya beans were grown, six of them will be carried on, but owing to poor yield and difficulty in harvesting three have been discarded.

Green gram, Bambarra Groundnuts and Pennisetum were also grown.

Cattle

Three of the four bullocks have survived another year. They are in fair condition and able to do light work such as ridging.

This is the most trying time of year (October-November) owing to great heat and poor feed, with the break of the rains the worst time for Tsetse fly. Injections of Antimosan (Bayer) were discontinued throughout most of the year, but have been started again for a short time as the animals seem to be stimulated and improve in condition almost immediately. By experience gained with the first lot of bullocks it is hoped to select suitable types for a continuation of the experiment next year.

The absence of a Veterinary Officer for the district for part of the year was felt very much.

Individual Native Holding Scheme.

A decision by which Government (represented by the Director of Agriculture) should be generally responsible for this scheme was not reached until mid August. In the meantime, a 10 acre model holding has been laid out along the main road near the village settlement. This holding will be run for two years with Station labour and is intended to act as a demonstration to both Individual Native Holders and passers by.

A six course rotation will be used including 2 years rest under pigeon pea and bush growth. Cotton, maize, Groundnuts and/or Green gram and Sorghum will be the main rotation, planted in 1½ acre blocks and making 9 acres in all. One acre will be reserved for fruit trees, root crops etc.

All intending settlers for the time being have moved into the village area and a borehole will be put down this year. Natives settled last year apear to have good stocks of food and any surplus in future can be taken over by the station for feeding non-local labour.

BUILDING

By

A. L. Cran.

Staff increases necessitated an extensive building programme being undertaken this year the required new buildings being three dwelling houses with garages and boys' quarters, laboratory and offices.

The latter are contained in one building, and will complete a block along with the old offices.

Foundation digging was started early in April, and brickmaking as soon as it was evident that the rains had ceased. This was at the end of April. Fully 800,000 bricks have been made and burned in five kilns, and firewood alone for the kilns was quite a large undertaking. Motor transport had to be used for firewood carrying, and also for some shifting of bricks.

Labour came in fairly well and we were fortunate in escaping a cerebro spinal meningitis scare which came within twelve miles of the Station. An influenza epidemic during August claimed a large number of victims and work had to be slowed down whilst it lasted. It was most noticeable that the temporary labourers were much more susceptible to the epidemic than the permanent labour force.

At time of writing, one house has been roofed, the gables of the second are now being built, and the third is just slightly behind the second.

The brickwork of the offices and laboratory is fully half way up the window frames, work is proceeding as quickly as possible and should be finished in ample time before the rains.

The three garages for the houses and one set of boys' quarters have been completed, and the other two sets of quarters are more than half buillt.

EUROPEAN AGRICULTURE.

Name of district.	Total acreage under cultivation. Acres.	Tobacco. Total. Acres under crop.	Tobacco. Total. Yield cwt.	Tobacco. *Fire-cured.* Acres under crop.	Tobacco. *Fire-cured.* Yield cwt.	Tobacco. *Flue-cured.* Acres under crop	Tobacco. *Flue-cured.* Yield cwt.	Tobacco. *Air-cured.* Acres under crop.	Tobacco. *Air-cured.* Yield cwt.	Tea. Acres under crop.	Tea. Yield cwt.	Coffee. Acres under crop.	Coffee. Yield cwt.
Lower Shire ...	2,927	15	70	...	...	...	...	*15*	*70*	...	...	...	...
Chikwawa ...	192	130	293	...	...	*130*	*293*	...	...	...	...	...	...
Central Shire ...	422	225	573	..	...	*225*	*573*	...	...	...	...	...	...
Cholo ...	24,184	1,797	4,347	*40*	*90*	*1,757*	*4,257*	...	...	8,577	36,533	33	140
Mlanje ...	14,358	613	1,503	*216*	*179*	*230*	*770*	*167*	*554*	8,939	60,413	63	52
Blantyre ...	6,333	1,642	4,714	...	...	*1,642*	*4,714*	...	...	...	...	150	117
Chiradzulu ...	1,957	221	662	...	...	*171*	*572*	*50*	*90*	...	...	3	7
Zomba ...	2,826	710	1,897	*17*	*31*	*675*	*1,838*	*18*	*28*	...	...	2	2
Upper Shire ...	362	91	469	*50*	*339*	*36*	*107*	*5*	*23*	...	...	...	...
South Nyasa ...	2,022	1,325	6,285	...	...	*1,065*	*5,644*	*260*	*641*	...	...	1	1
Ncheu ...	959	514	1,927	*5*	*6*	*155*	*460*	*354*	*1,461*	...	...	...	...
Dedza ...	630	215	1,056	..	...	*205*	*1,036*	*10*	*20*	...	...	...	...
Fort Manning ...	294	132	326	*30*	*80*	*27*	*69*	*75*	*177*	...	...	...	...
Lilongwe ...	3,743	506	1,893	*34*	*110*	*194*	*824*	*278*	*959*	...	...	1	...
Dowa ...	456	15	45	...	...	...	...	*15*	*45*	...	...	...	...
Kota Kota ...	16	...	...	...	...	...	...	...	...	...	...	...	...
Kasungu ...	13	...	...	...	...	...	...	...	...	...	...	...	...
Mzimba ...	253	...	...	...	...	...	...	...	...	3	...	114	91
West Nyasa ...	1,427	...	...	...	...	...	...	...	...	...	...	...	...
North Nyasa ...	115	...	...	...	...	...	...	...	...	...	...	54	20
Total ...	63,489	8,151	26,060	*392*	*835*	*6,512*	*21,157*	*1,247*	*4,068*	17,519	96,946	421	430

NOTE:—TEA: Acreage in plucking 1938 was 15,227. COFFEE: Acreage in bearing 1938 was 280.

EUROPEAN AGRICULTURE—CONTINUED.

Name of district	Sisal. Acres under crop.	Sisal. Yield cwt.	Cotton. Acres under crop.	Cotton. Yield cwt. (lint)	Rubber. Acres under crop.	Rubber. Yield cwt.	Chillies and Capsicums. Acres under crop.	Chillies and Capsicums. Yield cwt.	Maize. Acres under crop.	Maize. Yield cwt.	Wheat. Acres under crop.	Wheat. Yield cwt.
Lower Shire ...	2,705	4,340	95	150	...	...	..	...	88	1,285	...	...
Chikwawa ...	...	...	...	...	...	...	...	...	15	240	...	...
Central Shire ...	...	...	...	...	...	...	...	...	30	300	...	...
Cholo ...	1,433	6,300	...	...	...	...	...	...	108	1,416	34	181
Mlanje ...	..	...	314	142	...	...	5	10	106	740	...	...
Blantyre ...	...	...	...	...	...	...	...	...	137	1,780	1	2
Chiradzulu ...	...	...	...	...	...	...	32	63	50	345	..	...
Zomba ...	...	...	...	...	...	...	...	...	54	552	2	6
Upper Shire ...	...	...	111	350	...	...	...	...	82	1,030	...	...
South Nyasa ...	...	...	...	...	...	...	...	...	103	1,530	...	...
Ncheu ...	...	...	...	...	...	...	...	...	102	989	8	24
Dedza ...	...	...	...	...	...	...	...	...	63	1,139	1	10
Fort Manning ...	...	...	...	...	...	...	...	...	8	120	...	...
Lilongwe ...	...	...	11	30	...	...	...	...	159	1,633	23	93
Dowa ...	...	...	77	171	...	...	...	...	33	813	4	54
Kota Kota ...	.	...	...	...	...	...	...	...	5	12	10	30
Kasungu ...	...	...	...	..	...	...	...	...	...	...	...	...
Mzimba ...	..	...	...	...	...	...	...	...	4	48	2	24
West Nyasa ...	...	...	...	..	1,300	1,397	...	...	86	1,548	...	...
North Nyasa ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	4,138	10,640	608	843	1,300	1,397	37	73	1,233	15,520	85	424

EUROPEAN AGRICULTURE—CONTINUED.

Name of district.	Legumes.							Oil Seeds.					
	Total.		*For food.*		*For fodder*		*For green manure*	Total.		*For crushing.*		*For food.*	
	Acres under crop.	Yield cwt.	*Acres under crop.*	*Yield cwt.*	*Acres under crop.*	*Yield cwt.*	*Acres under crop.*	Acres under crop.	Yield cwt.	*Acres under crop.*	*Yield cwt.*	*Acres under crop.*	*Yield cwt.*
Lower Shire	2	3	...	...	*2*	*3*	...	2	36	...	...	*2*	*36*
Chikwawa	...	...	...	...	...	...	...	...	...	...	...	...	...
Central Shire	73	209	*36*	*209*	...	...	*37*	...	...	...	...	...	...
Cholo	756	1,160	*98*	*320*	*5*	*840*	*653*	4,908	14,124	*4,897*	*14,027*	*11*	*97*
Mlanje	1,100	341	*93*	*341*	...	...	*1,007*	10	16	...	...	*10*	*16*
Blantyre	654	3,884	*102*	*544*	*339*	*3,340*	*213*	291	1,433	*281*	*1,378*	*10*	*55*
Chiradzulu	200	2,405	*3*	*5*	*120*	*2,400*	*77*	195	472	*189*	*424*	*6*	*48*
Zomba	542	868	*188*	*812*	*23*	*56*	*331*	43	261	*16*	*113*	*27*	*148*
Upper Shire	38	130	*10*	*100*	*1*	*30*	*27*	12	145	...	...	*12*	*145*
South Nyasa	228	46	*38*	*46*	...	...	*190*	...	...	...	...	...	...
Ncheu	14	379	*14*	*379*	...	...	...	6	23	*5*	*20*	*1*	*3*
Dedza	59	540	*49*	*540*	...	...	*10*	4	24	...	...	*4*	*24*
Fort Manning	19	66	*7*	*66*	...	...	*12*	5	50	...	...	*5*	*50*
Lilongwe	408	382	*59*	*365*	*5*	*17*	*344*	47	389	...	.	*47*	*389*
Dowa	26	11	*4*	*11*	...	...	*22*	51	398	*1*	*5*	*50*	*393*
Kota Kota	...	...	...	...	...	...	...	...	...	...	...	...	...
Kasungu	...	...	...	...	...	...	...	...	...	...	...	...	...
Mzimba	...	..	...	...	...	..	..	2	20	...	...	*2*	*20*
West Nyasa	22	740	*22*	*740*	...	...	...	19	542	...	...	*19*	*542*
North Nyasa	...	...	...	...	...	...	...	45	400	*45*	*400*	...	...
Total ...	4,141	11,164	*723*	*4,478*	*495*	*6,686*	*2,923*	5,640	18,333	*5,434*	*16,367*	*206*	*1,966*

EUROPEAN AGRICULTURE—CONTINUED.

Name of district.	Tung Oil.		Fruit Trees.		Nut-Bearing Trees.		Miscellaneous.		Woodland Artificially Established
	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres.
Lower Shire	...	...	1	...	...	...	...	...	19
Chikwawa	...	...	30	...	...	...	...	...	17
Central Shire	...	...	14	215	...	...	...	...	80
Cholo	1,651	47	506	20	15	...	21	88	4,345
Mlanje	290	16	291	391	...	...	2	11	2,625
Blantyre	3	...	16	3	...	...	...	...	3,439
Chiradzulu	20	...	26	...	...	...	...	...	1,210
Zomba	77	55	15	...	...	...	25	...	1,356
Upper Shire	1	...	5	...	...	...	...	...	22
South Nyasa	...	...	1	...	...	...	...	...	364
Ncheu	...	...	14	43	...	...	...	...	301
Dedza	...	...	20	130	...	...	...	...	268
Fort Manning	...	...	9	3	...	...	...	...	121
Lilongwe	12	...	26	96	...	...	...	...	2,550
Dowa	...	...	2	...	...	...	...	...	248
Kota Kota	...	...	1	10	...	...	...	...	...
Kasungu	...	...	...	...	...	...	...	...	13
Mzimba	14	...	4	...	...	...	...	...	110
West Nyasa	...	...	...	...	...	...	...	...	...
North Nyasa	...	...	...	...	...	...	...	...	16
Total ...	2,068	118	981	911	15	...	48	99	17,104

NOTE: The following correction to the 1937 figures:—Tung Oil.

Mlanje 759 acres, 4,330 cwts. yield. Total Nyasaland 1,677 acres, 4,364 cwts. yield this should read: Mlanje 253 acres, 8 cwts. yield. Total Nyasaland 1,171 acres, 42 cwts. yield.

LIVE STOCK OWNED BY EUROPEANS AT 31ST DECEMBER, 1938.

District.	Cows and heifers.	Bulls.	Oxen.	Calves.	Pedigree cattle.	Horses.	Mules.	Donkeys.	Sheep.	Goats.	Pigs.
Lower Shire	914	63	240	319	...	...	...	30	127	99	54
Chikwawa	248	8	63	110	...	1	...	...	...	30	...
Central Shire	29	4	12	22	...	...	...	8	4	9	15
Cholo	1,445	42	801	541	7	35	...	15	323	56	53
Mlanje	1,263	26	758	593	5	1	...	1	128	...	7
Blantyre	991	25	487	510	19	4	...	4	44	1	159
Chiradzulu	533	10	269	228	7	...	...	2	...	...	75
Zomba	1,142	26	780	417	9	21	...	24	99	25	70
Upper Shire	8	1	6	5	...	...	...	...	30	53	35
South Nyasa	144	2	37	47	...	...	...	1	24	112	10
Ncheu	323	16	187	103	...	...	...	16	120	...	171
Dedza	300	12	208	212	7	1	1	27	40	4	42
Fort Manning	81	4	66	42	...	...	...	...	17	...	15
Lilongwe	392	24	253	143	...	1	...	36	53	18	253
Dowa	14	...	22	6	...	...	...	1	101	9	5
Kota Kota	25	1	28	11	...	...	...	2	30	...	...
Kasungu	...	...	...	...	...	...	...	...	...	...	38
Mzimba	8	..	24	2	...	...	...	4	...	...	40
West Nyasa	14	1	8	4	...	...	...	...	...	5	...
North Nyasa	62	5	79	33	...	...	...	...	73	...	50
Total ...	7,936	270	4,328	3,348	54	64	1	171	1,213	421	1,092

Report of the Native Tobacco Board.

PART I.

The members of the Board during the year were:

The Director of Agriculture (Chairman)
The Honourable The Treasurer
The Senior Provincial Commissioner
The Provincial Commissioner, Northern Province
Mr. A. F. Barron, O.B.E.
Dr. I Conforzi

The Honourable Mr W. Tait Bowie resigned from the Board in January and his place was not filled. The Honourable Capt. W. Evans, acted for Mr. A. F. Barron, during the latter's absence on leave.

Staff. The Board's staff is shown in the staff list at the beginning of this publication.

Messrs. J. W. Burton, G. D. N. Bartlett, F. I. Scott, A. B. Cormack, G. C. Dow, W. L. Maxwell, and J. A. Miller, Supervisors, and Mr. R. E. Jackson, Agricultural Superintendent, were on leave during the year.

Mr. R. J. Sanderson, Supervisor, retired on November 1, Mr. W. D. Lewis, Supervisor, retired on August 16. The employment of Mr. H. A. Roberts, Supervisor, terminated on October 31 and of Mrs. M. G. Wilbraham, Temporary Clerk, on September 1. Mr. R. Neil, Clerk, was transferred to the Agricultural Department on July 1. The following local appointments were made: Messrs. J. C. Onions, W. Gibson, J. R. Findlay, G. T. Stacey, Supervisors on January 5, September 10 and November 1 and 16 respectively; Messrs. A. Carr and R. Nash, Junior Supervisor on March 1 and November 1 respectively; Mr. N. R. Bartlett, Clerk on June 1, Mr. J. W. Burton, Supervisor, acted as Agricultural Superintendent during Mr. Jackson's absence on leave.

Until 1938 the Board was concerned with the production side of the Native Trust Land dark fired tobacco crop only and with general agriculture in the native tobacco areas.

Following the introduction of the auction system of selling tobacco in 1938 the Board undertook to purchase all Trust Land tobacco, pack it and place it on the auction floors for sale. This involved a very large addition to the work and responsibilities of the Board and its staff. Receiving stations had to be established and staffed and a very large organisation had to be set up for the purpose of receiving, classifying, buying, packing, transporting, and accounting for the crop of over 9,000,000 lbs. in a comparatively short time.

The system of purchasing adopted was to estimate the price that the tobacco would realise at auction and from this figure to deduct the cost of transport, of the selling organisation and of all the Board's activities and to pay out a sum per lb. of tobacco calculated to leave no margin of profit or loss.

It was expected that prices paid would have to be varied from time to time in accordance with prices realised at auction but in the end few such variations were necessary.

The Board paid the following sums for the grades bought:—

A	Grade	Special wrapper	4d −4½d
B	,,	Thick leaf over 22″ long ...	3d −4d
C	,,	Thin leaf over 22″ long ...	2½d−3d
D	,,	Thick leaf 19″—22″ long ...	2½d−3½d
E	,,	Thin leaf 19″—22″ long ...	2d −2½d
F	,,	Any Sound leaf 15″—19″ long ...	1½d−2d
G	,,	Any Sound leaf under 15″ long ...	1d −1½d

The average price paid was 2.26d per lb. in the Southern Province and 2.09d per lb. in the Northern Province and the net result of the Board's transactions may be considered to have been satisfactory in that no appreciable profit or loss was made. The overhead cost of the Board's operations were covered by a deduction of 1.16d per lb. of tobacco sold. Of this figure .43d per lb. was required to cover transport, auction floor charges and cess. Buying costs amounted to .24d per lb. and .49d per lb. covered the cost of all the activities of the Board in supervising the growing, curing and handling of the crop, general agriculture connected therewith and experimental work.

Buying stations were established for the season at the following points and the amount of tobacco purchased at each is shown against the station :—

Palombe	765,877 lbs.
Namalanga	578,901 lbs.
Limbe	240,757 lbs.
Zomba	169,277 lbs.
Mlomba	34,925 lbs.
Mbemvu	154,322 lbs.
Sharpe Vale	207,816 lbs.
Balaka	118,673 lbs.
Nsaru	2,063,497 lbs.
Lombadzi	1,256,580 lbs.
Nathenje	1,507,861 lbs.
Mponela	1,912,813 lbs.
Tembwe	49,082 lbs.

The Southern Province stations were opened on March 29th and the Northern Province stations on May 4th.

After the buying season the Board commenced to build permanent stations at all the above points except Limbe and Tembwe. A station was built at Mombezi to serve the Chiradzulu district instead of the Limbe station and as little tobacco was expected to be grown in the Tembwe area it was not considered advisable to build a station there.

The number of registered Native Trust Land growers were: Northern Province; 40,45 3 Southern Province 11,862. These figures represent decreases of 31.29 and of 4.83 per cent respectively when compared with the registrations of the 1936/37 season. The figures for 1936/37 were 58,878 and 12,465. These reductions in the numbers of growers are attributed mainly to the low prices realised in the previous season which discouraged growing and in part to growers leaving the Protectorate for work in other countries.

It is the policy of the Board to maintain a safety point of production and efforts in this direction have attained a certain measure of success. The size of gardens in the Northern Province was regulated, and in the case of growers on land of less than medium fertility, a considerable reduction was made.

The total amount of Native Trust Land tobacco produced in the two provinces was as follows The figures for the 1937 crop are quoted for comparison.

SOUTHERN PROVINCE

		1936/37		1937/38
Mlanje	...	1,368,423	...	809,645
Cholo	...	30,408	...	34,862
Blantyre	...	367,892	...	71,022
Chiradzulu	...	861,036	...	670,006
Zomba	...	216,212	...	169,277
Upper Shire	...	27,645	...	136,379
South Nyasa	...	—	...	1,051
	Total	2,871,616		1,892,242

NORTHERN PROVINCE

		1936/37		1937/38
Ncheu	...	219,551	...	378,306
Fort Manning	...	208,020	...	163,189
Dedza ...	...	549,104	...	241,534
Dowa ...	...	1,777,377	...	1,979,175
Kasungu ...	...	35,259	...	24,593
Kota Kota	...	554,230	...	455,314
Lilongwe ...	...	4,641,486	...	3,926,028
	Total	7,985,027		7,168,139

The average quantity of tobacco sold by Trust Land growers was: in the Southern Province 159 lbs.; in the Northern Province 177 lbs.; and the nett return to the average grower for his crop was therefore: Southern Province 29s. 1d.; Northern Province 30s. 9d.; compared with 31s. 7d.; and 19s. 10d. respectively in the previous year and a ten years average of 33s. 5d. and 38s. 11d. respectively.

It is a matter for regret that the native producer was dissatisfied with the new method of marketing adopted. Although he received a higher average price for his crop than in the previous year he did not make high prices for his first deliveries such as he had been accustomed to in previous years years and did not appreciate the fact that he was gaining by the introduction of the new system and he missed the opportunity of taking his tobacco round to different buyers and bargaining with them.

It is however anticipated that he will, when he becomes more familiar with the system appreciate its superiority over previous marketing arrangements.

Partly to assist in enlightening growers and equally to give them an opportunity of expressing their views arrangements were made after the buying season to form committees of leading growers to maintain contact with the Board's Supervisors in each of the Supervisor areas in the Lilongwe area. These Committees are functioning satisfactorily and are valuable to and appreciated by both parties.

Part II

Statements of receipts and expenditure for the year ending 31st December, 1938, is as follows:—

Native Tobacco Board.

STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDING 31ST DECEMBER, 1938.

RECEIPTS

LANCE BROUGHT FORWARD FROM 1937				£13,433	5	7
venue						
Tobacco Tax	£427	4	6			
Sale of Tobacco Seed to Natives	2,147	6	10			
Sale of Tobacco Seed to Europeans ...	6	3	11			
Sale of Tobacco Leaf ...	76	4	0			
Sale of Miscellaneous Seeds and Plants ...	51	16	1			
Miscellaneous Receipts ...	39	1	11			
Sale of Bush Car ...	15	0	0			
Sale of Plants and Gardens Booklet		12	6			
Overpayments in Previous Years Recovered ...	16	4	9			
Interest on Fixed Deposits	120	0	0	2,899	14	6
OBACCO SALES (GROSS) ...				125,803	0	5
ONTRIBUTION BY NYASALAND GOVERNMENT TOWARDS COST OF SUPERVISORS				540	0	0
DVANCES RETURNED				904	9	3
ALANCE DUE TO TREASURY ...				1,231	15	1
Carried forward				£144,812	4	10

PAYMENTS

BALANCE DUE TO TREASURY BROUGHT FORWARD FROM 1937							£366	3	5
Personal Emoluments: European Staff									
Agent and Senior Supervisor, £700 ...	£700	0	0						
Agricultural Superintendent, £400 for ten years then £500	433	6	8						
Eight Supervisors, £400 for ten years then £500	3,450	0	0						
Two Supervisors, £400	400	0	0						
Five Supervisors, £360	1,652	2	7						
Three Junior Supervisors, £186 by £15 to £246 by £18 to £300	386	17	7						
Four Temporary Supervisors, £360 ...	1,440	0	0						
Clerks, Temporary, three at £25 per month	425	0	0						
Clerk, Temporary, at £15 per month	60	0	0						
Allowance to Officer-in-charge, Lilongwe Experimental Station	50	0	0						
Acting Allowance	6	5	0						
Allowances to Members of Board ...	403	12	7						
Allowances to certain members of staff	283	0	0						
Allowance to Auditor	50	0	0						
House allowance in lieu of quarters	15	12	3						
Gratuity to Mr. H. A. Roberts ...	66	13	4						
Gratuity to Mr. R. J. Sanderson ...	125	0	0	£9,947	10	0			
Native Staff									
Fourteen Clerks, rates and periods variable, £10 4/- to £30	179	19	8						
Two hundred and sixty-four Capitaos, rates and periods variable, £4 16/- to £18	£2,152	10	0						
Eleven Watchmen, rates variable, £4 16/- to £7 4/-	43	10	0						
Five Messengers, rates variable, £4 16/- to £7 4/-	39	19	1	£2,415	18	9			
TOTAL PERSONAL EMOLUMENTS							£12,363	8	9
Other Charges									
Travelling				2,558	13	5			
Passages				718	8	9			
Buildings, Lilongwe—Upkeep of				3	0	5			
Buildings, Lilongwe Experimental Station, Upkeep of				11	0	6			
Buildings, Zomba Experimental Station, Upkeep of				27	6	8			
Seed and Experimental Plots, Mtiti				36	16	0			
Seed and Experimental Plots, Capitaos ...				52	5	0			
Lilongwe Experimental Station				465	15	11			
Tobacco Nurseries				110	7	5			
District Experimental Work				97	19	6			
Stationery and Printing				197	19	7			
Implements and Equipment				89	4	7			
Incidentals				47	12	6			
Uniforms				284	14	3			
Camp Equipment				105	1	6			
Miscellaneous transport of Board's & Employees' effects				19	5	5			
Library				1	10	0			
Medical Drugs etc., for Staff and travelling of Medical Officers attending Staff				5	9	2			
TOTAL OTHER CHARGES							£4,832	10	7
Contributions									
Zomba Experimental Station				401	11	5			
Nyasaland Government, Clerical Assistance ...				374	15	0			
Forestry				99	11	0			
Native Agricultural Show, Lilongwe ...				25	0	0			
Lilongwe Aerodrome				100	0	0			
TOTAL CONTRIBUTIONS							1,000	17	5
Special Expenditure									
Roads and Bridges				56	12	6			
Seven Tarpaulins				22	10	0			
Agent and Senior Supervisor's Office				9	17	2			
Tents				190	3	0			
Secretary's House				18	7	9			
Farm Cart				46	10	10			
House for Supervisor, Zomba district (including Furniture)				468	0	2			
Five Houses (including Furniture)				534	5	4			
Buildings, Zomba Experimental Station:									
Compost Factory				45	11	4			
Cattle Sheds				69	11	1			
House for Supervisor, Mombezi (including Furniture)				325	12	7			
Typewriter				23	11	11			
TOTAL SPECIAL EXPENDITURE							1,810	13	8
Carried forward							£20,373	13	10

Native Tobacco Board (*Continued*).

STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDING 31ST DECEMBER, 1938.

RECEIPTS	
BROUGHT FORWARD	£144,812 4 10
	£144,812 4 10

PAYMENTS			
BROUGHT FORWARD			£20,373 13 10
Marketing of Native Trust Land Tobacco			
Buildings: Tobacco Receiving Stations			
(*a*) Temporary Builders, European	105 13 11		
(*b*) Labour	1,733 3 8		
(*c*) Materials and rents ...	2,219 5 6	4,058 3 1	
Namalanga Estate, Buildings and Equipment, Purchase of		£450 0 0	
Temporary Marketing Staff, European ...		4,126 0 3	
Temporary Marketing Staff, European, Travelling		250 17 6	
Temporary Marketing Staff, Native		1,295 15 6	
Watchmen		33 15 7	
Staff Fidelity Premiums		74 0 6	
Purchase of Tobacco		76,488 6 4	
Handling and Grading of Tobacco		60 7 6	
Auction Company's charges:			
(*a*) Auction and Weighing Fee		6,621 7 4	
(*b*) Tobacco Cess		509 15 7	
Transport of Tobacco		9,490 12 2	
Insurance of Tobacco		37 11 0	
Interest on Government Advance		108 19 8	
Interest on Bank Overdraft		22 6 6	
Insurance and Transport of Cash		62 1 6	
Implements and Equipment		4,238 16 10	
Stationery		216 9 10	
Office Furniture		37 7 0	
		108,182 13 8	
Lilongwe Auction Floor:			
Temporary Builder, European ...	£264 10 4		
Temporary Builder, Travelling ...	36 16 0		
Labour	1,234 5 1		
Materials	4,837 8 3	6,372 19 8	
Watchman		1 17 0	
Boreholes		100 0 0	
TOTAL MARKETING OF NATIVE TRUST LAND TOBACCO			114,657 10
TOTAL EXPENDITURE			135,031 4
ADVANCES MADE			566 9
BALANCES CARRIED FORWARD TO 1939 ...			
Current Account at Bank			9,214 11
			£144,812 4 1

For Native Tobacco Board { D. L. BLUNT, Chairman.
J. A. CALLOW, Secretary.

ZOMBA, 2nd May, 1939.

I have examined the accounts and vouchers of the Native Tobacco Board for the year 1938. Subject to th qualifications contained in my reports to the Board and to Government, I am satisfied that the above is a true an correct statement of the Board's receipts and payments.

3rd July, 1939.

(Sgd.) F. S. WILLIAMS,
Acting Auditor.